The Mammals of North America: Volume II

HALL KELSON

Arctic Ocean
Bering Strait
ALEUTIAN ISLANDS (U.S.)
ALASKA
GREENLAND
Franklin
Davis Strait
NORTHWEST TERRITORIES
YUKON
Mackenzie
Keewatin
CANADA
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
Hudson Bay
Labrador
NEWFOUNDLAND
QUEBEC
ONTARIO
PRINCE EDWARD ISLAND
NEW BRUNSWICK
NOVA SCOTIA
Pacific Ocean
Atlantic Ocean
WASHINGTON
OREGON
CALIFORNIA
IDAHO
NEVADA
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICHIGAN
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MARYLAND
DELAWARE
NEW JERSEY
RHODE ISLAND
CONNECTICUT
MASSACHUSETTS
NEW HAMPSHIRE
VERMONT
MAINE
UNITED STATES
BERMUDA
BAJA CALIFORNIA
SONORA
CHIHUAHUA
COAHUILA
NUEVO LEÓN
TAMAULIPAS
SINALOA
DURANGO
ZACATECAS
NAYARIT
SAN LUIS POTOSÍ
HIDALGO
TLAXCALA
VERACRUZ
JALISCO
AGUASCALIENTES
COLIMA
GUANAJUATO
MICHOACÁN
QUERÉTARO
GUERRERO
MÉXICO
DISTRITO FEDERAL
MORELOS
PUEBLA
OAXACA
CHIAPAS
YUCATÁN
CAMPECHE
TABASCO
QUINTANA ROO
Gulf of Mexico
BAHAMA ISLANDS
CUBA
DOMINICAN REPUBLIC
PUERTO RICO
JAMAICA
HAITI
Greater Antilles
Lesser Antilles
Barbados
Caribbean Sea
BRITISH HONDURAS
HONDURAS
GUATEMALA
EL SALVADOR
NICARAGUA
CENTRAL AMERICA
COSTA RICA
PANAMÁ
CANAL ZONE (U.S.)
Scale of Miles
0 200 400 600 800 1000
Vaughn Gray

Bering Strait
Arctic Ocean
Davis Strait
Hudson Bay
Pacific Ocean
Atlantic Ocean
Gulf of Mexico
Caribbean Sea
LIFE ZONES
Boreal Region
Arctic
Hudsonian
Canadian
Austral Region
Transition
Upper Austral
Lower Austral
Tropical Region
Tropical
Scale of Miles
0 200 400 600 800 1000
Vaughn Gray

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THE MAMMALS

OF

NORTH AMERICA

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THE MAMMALS
OF
NORTH AMERICA

Family CASTORIDAE—Beavers

Rostrum broad and deep; braincase narrow; basioccipital region with conspicuous pitlike depression; cheek-teeth not ever-growing but so excessively hypsodont that the slightly reduced heptamerous pattern changes little with age and rarely if ever wears out; external form highly modified for aquatic life; tail paddlelike and caudal vertebrae flattened (after Miller and Gidley, 1918:435). Insicors strongly developed; baculum present in males. Dentition, c. $\frac{1}{1}$, i. $\frac{0}{0}$, p. $\frac{1}{1}$, m. $\frac{3}{3}$.

Genus Castor Linnaeus—Beavers

1758. *Castor* Linnaeus, Syst. Nat., ed. 10, 1:58. Type, *Castor fiber* Linnaeus, 1758.

Largest rodent north of Panamá, many adults weighing more than 60 lbs.; body thickset and compact; legs short; ears small; hind feet large, pentadactyl, unguiculate, toes webbed; tail broad, flat, nearly hairless and covered with large scales. Pelage consisting of unusually dense, fine underfur but overlaid with many coarse guard hairs.

Castor canadensis
Beaver

Upper parts a rich glossy brown, the shade varying seasonally and geographically; underparts brown to tawny; tail and feet black.

The role of the beaver in the early history of the United States and Canada in attracting trappers to unexplored areas points up the former abundance of this now comparatively uncommon rodent.

Beavers are aquatic mammals but are usually found only in streams. A dam of sticks, mud, and rocks is constructed to impound water and form ponds some many acres in extent. The ensuing control of runoff is important in many places in erosion control and maintaining an adequate water-table. Sediment accumulating in a pond eventually forces the beaver colony to move and the former pond site becomes a meadow. In many mountainous regions of the western United States, the stock carrying capacity of range land is increased by meadows formed on former pond-sites.

Beavers construct and live in dome-shaped lodges made of sticks and mud. There are one or more underwater entrances below the ice level. The lodges vary from those a few feet high to those high enough to permit a man to stand erect. Especially in large rivers, beavers do not build lodges but instead burrow into banks.

From one to several families live in one lodge and there are often many lodges in a colony.

Food consists of bark and cambium, especially of willows, alders, birches, and aspens. The plants, including trees of more than a foot in diameter, are felled by gnawing. Pieces are cut into sections of a size that can be handled by a beaver and are then dragged down a steep slope to the water or, in flatter situations, floated to the pond through a system of beaver-made canals. Branches for winter food are sunk to the deeper parts of the pond and anchored for winter use.

Beaver are extirpated or seriously reduced over much of their former range. Most states and provinces have established management practices and the beaver is responding. Only in places where they are inimical to agricultural pursuits is it necessary to reduce the populations. Such reductions should be made only after study of the particular situation indicates the necessity for reducing numbers.

The young usually are born in April or May after a gestation period of about 3 months. A litter consists of 2 to 8 kits, usually 4. The young ordinarily remain with their parents throughout the first year.

Castor canadensis acadicus V. Bailey and Doutt

1942. *Castor canadensis acadicus* V. Bailey and Doutt, Jour. Mamm., 23:87, February 14, type from Nepisiquit River, New Brunswick.

MARGINAL RECORDS.—Quebec: *central Ungava north of Lake Mistassini* (Cameron and Morris, 1951:127); St.

Marguerite River (V. Bailey and Doutt, 1942:88), thence down Atlantic seaboard probably to eastern Connecticut. New Hampshire: Charleston (V. Bailey and Doutt, 1942: 88). New York: Raquette Lake (*ibid.*). Quebec: Lake Mistassini (Anderson, 1947:132).

Castor canadensis baileyi Nelson

1927. *Castor canadensis baileyi* Nelson, Proc. Biol. Soc. Washington, 40:125, September 26, type from Humboldt River, 4 mi. above Winnemucca, Humboldt Co., Nevada.

MARGINAL RECORDS.—Oregon (V. Bailey, 1936:224): Silvies River; Kiger Creek. Nevada (Hall, 1946:488): Marys River, 25 mi. N Deeth, 5800 ft.; *Deeth*; Toyn Creek, 7000 ft., near summit Harrison Pass; type locality. Oregon: Big Fish Creek (V. Bailey, 1936:224).

Castor canadensis belugae Taylor

1916. *Castor canadensis belugae* Taylor, Univ. California Publ. Zool., 12:429, March 20, type from Beluga River, Cook Inlet region, Alaska.

MARGINAL RECORDS.—Yukon: *Porcupine River drainage* (Rand, 1945b:51); Mile 286, Macmillan Pass (Rand, 1945a:39). British Columbia (Cowan and Guiguet, 1956: 173): Lower Stikine River; Terrace; Wistaria; Anahim Lake; W branch of Homathko River; thence northward on Pacific Coast to Alaska: Snug Harbor (Taylor, 1916:430–431); *Mt. Peulik* (Osgood, 1904:33—W of shaded area on Map 321); thence northward including all of Alaska northward to *Brooks Range* except the west coastal plains (Dufresne, 1942:20); east of Ladd Air Force Base (Strecker *et al.*, 1952:479).

Castor canadensis caecator Bangs

1913. *Castor caecator* Bangs, Bull. Mus. Comp. Zool., 54: 513, July, type from near Bay St. George, Newfoundland.
1942. *Castor canadensis caecator*, G. M. Allen, Extinct and vanishing mammals, Western Hemisphere, p. 62, Dec. 11.

MARGINAL RECORDS.—Newfoundland (G. M. Allen, 1942a:63): Port Saunders; Gander River; *Red Indian Lake*; type locality. Not found, Bay d'Espoir (*ibid.*).

Castor canadensis canadensis Kuhl

1820. *Castor canadensis* Kuhl, Beitr. z. Zool. u. vergleich. Anat., Abth. 1, p. 64, type locality, Hudson Bay.

MARGINAL RECORDS.—Yukon Territory: *northern Yukon* (Anderson, 1947:132). Mackenzie: Mackenzie Delta (Banfield, 1951:117). Manitoba: Seal River (Preble, 1902: 49). Ontario: Lake Abitibi region (Snyder, 1928:11); Algonquin Park (Saunders, 1932:292); thence southeastward to Atlantic coast possibly in *western Connecticut* and down coast to Virginia (Handley and Patton, 1947:159): Brunswick County; *Nottoway County*; Nelson County; Wythe County. West Virginia: upper end Long Shoal, a few miles below Kanawha Falls (Kellogg, 1937:463). Pennsylvania: Greene County (Grimm and Roberts, 1950:68); [Erie County] (Richmond and Roslund, 1949:25). Ontario: Bothwell (Saunders, 1932:294); Nepigon (Miller, 1897a:26). Wisconsin: Sawyer County (Cory, 1912:170); Menominee Indian Reservation (Komarek, 1932:207). Iowa: *possibly extreme northeastern Iowa* (Scott, 1937:73). North Dakota: Mouse River Valley (V. Bailey, 1927:105). Saskatchewan: Long Creek (Soper, 1946:144). Montana: Glacier National Park (V. Bailey, 1918:64). British Columbia: South Pine (G. M. Allen, 1942a:81); vicinity Laurier Pass (Sheldon, 1932:201).

Castor canadensis carolinensis Rhoads

1898. *Castor canadensis carolinensis* Rhoads, Trans. Amer. Philos. Soc., n.s., 19:420, September, type from Dan River, near Danbury, Stokes Co., North Carolina.

MARGINAL RECORDS.—Indiana (Lyon, 1936:226): Laporte County; Steuben County; thence eastward *presumably throughout Ohio except extreme northeastern part.*

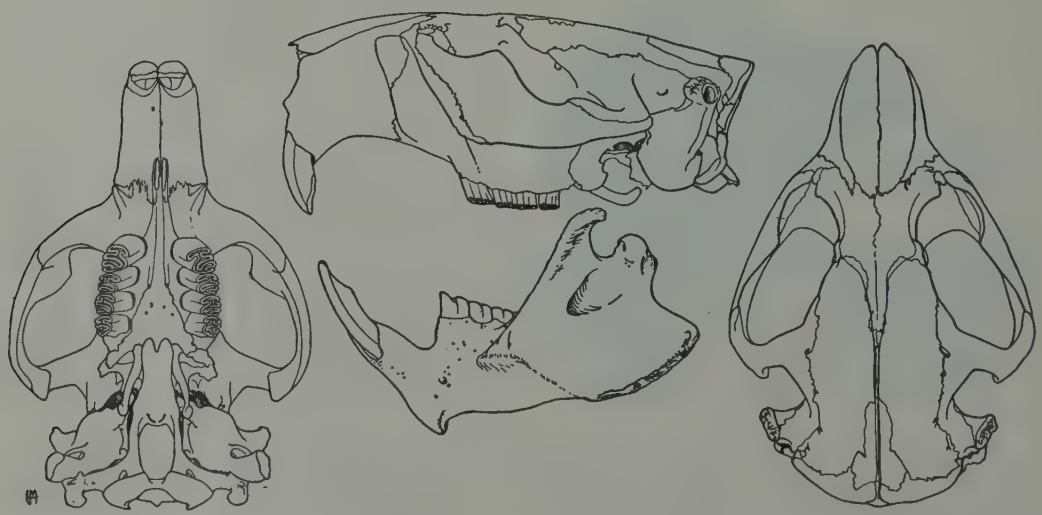
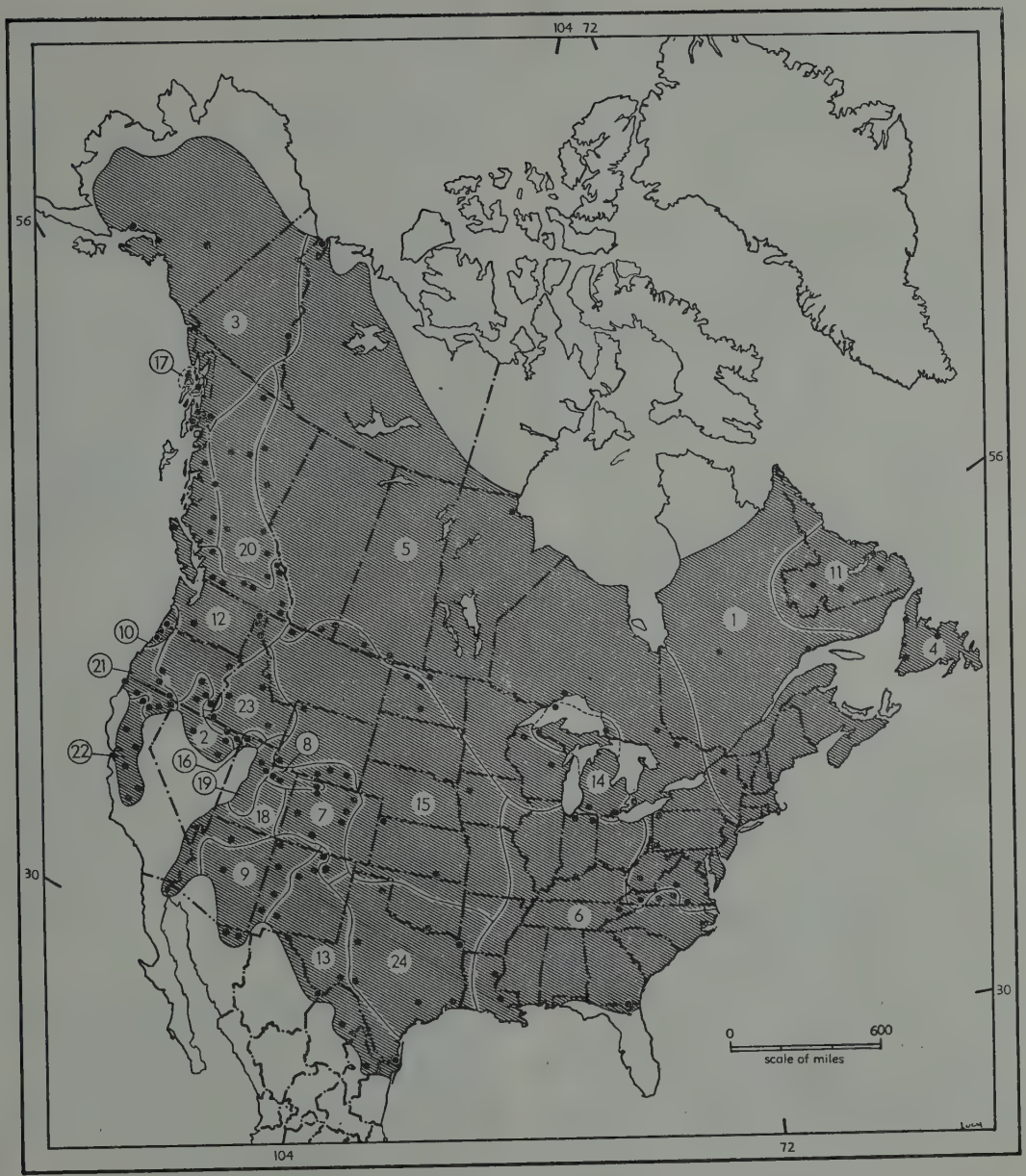


Fig. 313. *Castor canadensis repentinus*, Colorado River, ½ mi. N California–Nevada Monument, Nevada, No. 61670 M.V.Z., ♀, X ⅓.



Map 321. *Castor canadensis.*

1. *C. c. acadicus*
2. *C. c. baileyi*
3. *C. c. belugae*
4. *C. c. caecator*
5. *C. c. canadensis*
6. *C. c. carolinensis*
7. *C. c. concisor*
8. *C. c. duchesnei*
9. *C. c. frondator*
10. *C. c. idoneus*
11. *C. c. labradorensis*
12. *C. c. leucodontus*
13. *C. c. mexicanus*
14. *C. c. michiganensis*
15. *C. c. missouriensis*
16. *C. c. pallidus*
17. *C. c. phaeus*
18. *C. c. repentinus*
19. *C. c. rostralis*
20. *C. c. sagittatus*
21. *C. c. shastensis*
22. *C. c. subauratus*
23. *C. c. taylori*
24. *C. c. texensis*

Tennessee: Holston River between Kingsport and Three Springs Ford (Kellogg, 1939:276). Virginia (Handley and Patton, 1947:159): Franklin County; *Bedford County*; Campbell County; *Charlotte County*, thence down coast to Georgia: 1 mi. E Lloyd's Island, Okefinokee Swamp (Harper, 1927:343). Louisiana (Lowery, 1943:243): Comite River; Sicily Island, thence northward through Mississippi Valley probably into *Illinois*.

Castor canadensis concisor Warren and Hall

1939. *Castor canadensis concisor* Warren and Hall, Jour. Mamm., 20:358, August 14, type from Monument Creek, SW of Monument, El Paso Co., Colorado.

MARGINAL RECORDS.—Wyoming: 3 mi. E Horse Creek P.O., 6400 ft. (22007 KU). Colorado: Morgan County (G. M. Allen, 1942a:68); Arapahoe County (*ibid.*); Lake Moraine, 10,250 ft. (Warren and Hall, 1939:362). New Mexico: *Cimarroncito Creek* (Hill, 1942:80); Rayado Canyon (*ibid.*). Colorado: Mineral County (G. M. Allen, 1942a:68); Gunnison River, 4750 ft., about 29 mi. NW Delta (Warren and Hall, 1939:362); Trappers Lake (Durrant, 1952:291). Wyoming: 7¼ mi. N, 18¾ mi. E Savery, 8400 ft. (26634 KU); 8 mi. N, 16 mi. E Encampment, 8400 ft. (26633 KU).

Castor canadensis duchesnei Durrant and Crane

1948. *Castor canadensis duchesnei* Durrant and Crane, Univ. Kansas Publ., Mus. Nat. Hist., 1(20):413, December 24, type from Duchesne River, 5600 ft., 10 mi. NW Duchesne, Duchesne Co., Utah.

MARGINAL RECORDS (Durrant, 1952:290–291).—Utah: Currant Creek, 6000 ft., Strawberry Valley; type locality. Colorado: 9½ mi. SW Pagoda Peak.

Castor canadensis frondator Mearns

1897. *Castor canadensis frondator* Mearns, Preliminary diagnoses of new mammals of the genera *Sciurus, Castor, Neotoma,* and *Sigmodon,* from the Mexican border of the United States, p. 2, March 5 (preprint of Proc. U.S. Nat. Mus., 20:502, January 19, 1898), type from Río San Pedro, Sonora, near Mon. 98, Mexican boundary.

MARGINAL RECORDS.—New Mexico: Liberty (V. Bailey, 1932:211, 213); *Blanco* (*ibid.*); headwaters Zuñi River (*ibid.*); headwaters Gila River (G. M. Allen, 1942a: 69); Gila River near Bedrock (V. Bailey, 1932:212). Sonora: Cañon de Guadalupe (Burt, 1938:50); type locality. Arizona: Fort Verde (Mearns, 1907:353).

Castor canadensis idoneus Jewett and Hall

1940. *Castor canadensis idoneus* Jewett and Hall, Jour. Mamm., 23:87, February 15, type from Foley Creek, tributary to Nehalem River, Tillamook Co., Oregon.

MARGINAL RECORDS.—Washington: Puget Island (Dalquest, 1948:322). Oregon: type locality; Blaine (G. M. Allen, 1942a:77).

Castor canadensis labradorensis V. Bailey and Doutt

1942. *Castor canadensis labradorensis* V. Bailey and Doutt, Jour. Mamm., 23:86, February 14, type from 5 mi. above Grand Falls, Hamilton River, Labrador.

MARGINAL RECORDS.—Labrador: near settlement of Northwest River, Hamilton Inlet (V. Bailey and Doutt, 1942:87); Paradise Valley (Anderson, 1947:132); 25 mi. above Lake Winokapau (V. Bailey and Doutt, 1942:87); type locality.

Castor canadensis leucodontus Gray

1869. *Castor canadensis leucodonta* Gray, Ann. Mag. Nat. Hist., ser. 4, 4:293, October, type from Vancouver Island, British Columbia.

1898. *Castor canadensis pacificus* Rhoads, Trans. Amer. Philos. Soc., n.s., 19:422, September, type from Lake Keechelus, about 3000 ft., Cascade Mts., Kittitas Co., Washington. Regarded as inseparable from *leucodontus* by Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 2:322, April 9, 1948.

MARGINAL RECORDS.—*British Columbia* (Cowan and Guiguet, 1956: 174 unless otherwise noted): Bush River; Golden; Fort Steele; Newgate (Anderson, 1947:133, as subspecies *sagittatus*). Idaho: Coolin (*ibid.*, as subspecies *sagittatus*); Bonner County (Rust, 1946:320); Shoshone County (*ibid.*). Oregon (V. Bailey, 1936: 218–219): Pine Creek near Pine; Jordan Creek near Rome; headwaters Deschutes River; Willamette Valley. Washington: Bear Prairie, 3 mi. S Longmire, Mt. Ranier National Park (Taylor and Shaw, 1927:108), thence along coast to British Columbia (Cowan and Guiguet, 1956:174, unless otherwise noted): Quatsino on Vancouver Island; Alta Lake (Racey and Cowan, 1935:H24); Chilliwack; Manning Park; Okanagan Landing; Kettle River Valley.

Castor canadensis mexicanus V. Bailey

1913. *Castor canadensis mexicanus* V. Bailey, Proc. Biol. Soc. Washington, 26:191, October 23, type from Ruidoso Creek, 6 mi. below Ruidoso, Lincoln Co., New Mexico.

MARGINAL RECORDS.—New Mexico: Culebra Mts., Costilla River, 9400 ft. (V. Bailey, 1932:215); headwaters Pecos River (G. M. Allen, 1942a:72). Texas: Pecos River Canyon (V. Bailey, 1905:124); Brownsville (V. Bailey, 1913:192). Tamaulipas: *Río Grande, 12 mi. below Matamoros* (V. Bailey, 1905:124). Nuevo León: China (Villa, 1954:446). Coahuila: Sabinas (Elliot, 1907:190). Texas: Johnson Ranch, Big Bend National Park, 2060 ft. (Borell and Bryant, 1942:28); Río Grande, El Paso Co. (Davis, 1940:84). New Mexico (V. Bailey, 1932:215): Garfield; near Alburquerque. Records from Bailey, 1905, were referred by him to *C. c. frondator*, but here are referred to *mexicanus* on geographic grounds.

Castor canadensis michiganensis V. Bailey

1913. *Castor canadensis michiganensis* V. Bailey, Proc. Biol. Soc. Washington, 26:192, October 23, type from Tahquamenaw River, 5 mi. above falls, Luce Co., Michigan.

MARGINAL RECORDS (Burt, 1946:202, unless otherwise noted).—Michigan: Isle Royale. Ontario: Pancake Bay (Anderson, 1947:132). Michigan: Monroe County; Kalamazoo County; Gogebic County.

Castor canadensis missouriensis V. Bailey

1919. *Castor canadensis missouriensis* V. Bailey, Jour. Mamm., 1:32, November 28, type from Apple Creek, 7 mi. E Bismarck, Burleigh Co., North Dakota.

MARGINAL RECORDS.—Alberta: Battle Creek (Anderson, 1947:132). Saskatchewan: Rocky Creek, S of Wood Mtn. (Soper, 1946:144). North Dakota: Antelope Creek

near Goodall (V. Bailey, 1927:110); near Sawyer (*ibid.*); type locality. Iowa: Sac County (Swanson, 1945:85). Missouri: *northwestern part* (Atwood, 1938:165). Kansas: Arkansas River, Cowley Co. (Cockrum, 1952:157); St. Francis (Cockrum, 1952:158). Wyoming: 9 mi. S Robertson, 8000 ft. (26632 KU); Yanceys, Yellowstone National Park (V. Bailey, 1919:32). Alberta: Milk River, N. of Sweet Grass Hills (Soper, 1946:144).

Castor canadensis pallidus Durrant and Crane

1948. *Castor canadensis pallidus* Durrant and Crane, Univ. Kansas Publ., Mus. Nat. Hist., 1:409, December 24, type from Lynn Canyon, 7500 ft., Boxelder Co., Utah.

MARGINAL RECORDS.—Utah: type locality; *Raft River, 5 mi. S Yost, Raft River Mts., 6000 ft.* (Durrant, 1952:287).

Castor canadensis phaeus Heller

1909. *Castor canadensis phaeus* Heller, Univ. California Publ. Zool., 5:250, February 18, type from Pleasant Bay, Admiralty Island, Alaska.

MARGINAL RECORDS.—Alaska: Chichagof Island (G. M. Allen, 1942a:79); Mole Harbor, Admiralty Island (Taylor, 1916:437).

Castor canadensis repentinus Goldman

1932. *Castor canadensis repentinus* Goldman, Jour. Mamm., 13:266, August 9, type from Bright Angel Creek, 4000 ft., Grand Canyon, Arizona.

MARGINAL RECORDS.—Utah: *presumably Colorado River drainage south of Tavaputs Plateau* (Durrant, 1952: 291). Arizona: type locality. Sonora: Colorado River, 30 mi. N of mouth (Burt, 1938:50). Nevada: Searchlight Ferry (Hall, 1946:489).

Castor canadensis rostralis Durrant and Crane

1948. *Castor canadensis rostralis* Durrant and Crane, Univ. Kansas Publ., Mus. Nat. Hist., 1:411, December 24, type from Red Butte Canyon, 5000 ft., Fort Douglas, Utah.

MARGINAL RECORDS (Durrant, 1952:289).—Utah: type locality; Kamas, 5500 ft.; *Charleston, Heber Valley, 5500 ft.; Millcreek Canyon, 7000 ft., 6 mi. above mouth.*

Castor canadensis sagittatus Benson

1933. *Castor canadensis sagittatus* Benson, Jour. Mamm., 14:320, November 13, type from Indianpoint Creek, 3200 ft., 16 mi. NE Barkerville, British Columbia.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:174, unless otherwise noted): Lower Liard Crossing; Fort Grahme; Isaacs Lake (Anderson, 1947:133); Murtle Lake; Eagle River; Chezacut; Wistaria; Driftwood River; Fort Halkett.

Castor canadensis shastensis Taylor

1916. *Castor subauratus shastensis* Taylor, Univ. California Publ. Zool., 12:433, March 20, type from Cassel, Hot Creek, near Pit River, Shasta Co., California.

1933. *Castor canadensis shastensis*, Grinnell, Univ. California Publ. Zool., 40:166, September 26.

MARGINAL RECORDS (G. M. Allen, 1942a:83, unless otherwise noted).—Oregon: Yamsey Mts.; Goose Lake. California: *head Lassen Creek* (Grinnell, *et al.*, 1937:723); north fork Pit River, above Alturas; type locality; Scott River; Klamath River above Requa.

Castor canadensis subauratus Taylor

1912. *Castor subauratus* Taylor, Univ. California Publ. Zool., 10:167, May 21, type from Grayson, San Joaquin River, Stanislaus Co., California.

1933. *Castor canadensis subauratus*, Grinnell, Univ. California Publ. Zool., 40:166, September 26.

MARGINAL RECORDS.—California (G. M. Allen, 1942a: 82–83, unless otherwise noted): McCloud; American River near Fair Oaks (Grinnell, *et al.*, 1937:635); *Merced River near Snelling* (*ibid.*); Kings River, Fresno Co.; Tulare Lake; *San Joaquin River near Mendota* (Grinnell, *et al.*, 1937: 635); Westley, near Grayson (Taylor, 1916:446); *Cache Slough, 10 mi. N Rio Vista* (Grinnell, *et al.*, 1937:635); N of Marysville Buttes.

Castor canadensis taylori Davis

1939. *Castor canadensis taylori* Davis, The Recent mammals of Idaho, Caxton Printers, Caldwell, Idaho, p. 273, April 5, type from Big Wood River, near Bellevue, Idaho.

MARGINAL RECORDS (Davis, 1939:274, unless otherwise noted).—Idaho: Salmon (City?); Portneuf River, 10 mi. NW Pocatello. Nevada (Hall, 1946:488): Goose Creek, 10½ mi. W Utah boundary, 5150 ft.; Jarbidge River. Idaho: South fork Owyhee River, 12 mi. N Nevada line; Boise River, 5 mi. W Boise.

Castor canadensis texensis V. Bailey

1905. *Castor canadensis texensis* V. Bailey, N. Amer. Fauna, 25:122, October 24, type from Cummings Creek, Texas.

MARGINAL RECORDS (V. Bailey, 1905:122–124, unless otherwise noted).—Texas: Canadian River not far from Canadian. Oklahoma: 7 mi. W Colbert (McCarley, 1952: 107, identified to species only). Texas: Texarkana (G. M. Allen, 1942a:87); Neches River near Beaumont; Cummings Creek (Strecker, 1926:25); 40 or 45 mi. NW Uvalde; Colorado River 10 mi. below Colorado City.

SUBORDER MYOMORPHA

Medial masseter muscle traverses infraorbital canal and exits on side of rostrum; infraorbital canal much enlarged; zygomatic plate (horizontal, narrow and beneath infraorbital canal) as in Dipodoidea, or (relatively broad and inclined) as in Muroidea but not so broad and inclined as in advanced sciuromorphs; postorbital processes never present. Dentition, i. $\frac{1}{1}$, c. $\frac{0}{0}$, p. $\frac{1-0}{1-0}$, m. $\frac{3-2}{3-2}$ (p. $\frac{0}{0}$, m. $\frac{3}{3}$ in most species, after Wilson, 1949:120).

KEY TO NORTH AMERICAN FAMILIES OF MYOMORPHA

1. Tail at least 1½ times length of head and body, naked and scaly; hind legs much elongated; infraorbital foramen much enlarged. . . . . Zapodidae, p. 770

1′. Tail less than 1½ times length of head and body, either haired or naked and scaly; hind legs not greatly elongated; infraorbital foramen moderately large.
2. Molar teeth with tubercles arranged in 3 longitudinal series. . . . Muridae, p. 767
2′. Molar teeth flat-crowned or with tubercles arranged in 2 longitudinal series. Cricetidae, p. 552

FAMILY CRICETIDAE—Cricetids

Molars cuspidate, laminate, or prismatic; rooted or rootless. This family is readily divisible into 2 groups, the cricetines and microtines. In the more primitive, the cricetines, the cheek-teeth are basically tuberculate, the tubercles being arranged in 2 longitudinal rows. In the microtines the cheek-teeth are markedly prismatic and usually rootless. Dentition, i. $\frac{1}{1}$, c. $\frac{0}{0}$, p. $\frac{0}{0}$, m. $\frac{3}{3}$.

This family includes a vast assemblage of rodents differing widely in habits, habitats, and structure. Hall and Cockrum (1953:379) treated this group as a Subfamily of the Muridae. With some reluctance, we treat it as a Family. *Simimys* of the Upper Eocene is probably the oldest known fossil genus.

KEY TO NORTH AMERICAN SUBFAMILIES OF CRICETIDAE

1. Skull comparatively smooth and unspecialized; molars having 2 longitudinal rows of tubercles or, if not tuberculate, prisms not arranged as alternating triangles and rostrum not long (see Figs. 377–390). . Cricetinae, p. 552
1′. Skull comparatively angular and sculptured; molars with enamel pattern composed of alternating triangles; rostrum short (see Figs. 392–423). . . . . Microtinae, p. 710

SUBFAMILY CRICETINAE

Slender to thickset rodents with pointed muzzles; limbs not hidden to any marked extent with integument; pentadactyl; tail usually relatively long; palatine bones not especially thickened; molars brachydont or hypsodont and, when hypsodont, not possessing alternating triangular prisms.

KEY TO NORTH AMERICAN GENERA OF CRICETINAE
(modified from Ellerman, 1946:332–340)

1. External form much modified for aquatic life (hind toes fringed with stiff hairs; underfur dense; webbing present between some toes); braincase much flattened. . . . . *Rheomys*, p. 708
1′. External form not modified for aquatic life (hind toes not fringed with stiff hairs; underfur not especially dense; no webbing between toes); braincase not markedly flattened.
2. Upper cheek-teeth specialized, their normal cuspidate pattern not apparent at any time (young *Neotomodon* a possible exception); molars prismatic and flat-crowned.
3. Third upper molar simplified, without inner fold. . . . . *Nelsonia*, p. 707
3′. Third upper molar with inner fold.
4. Folds of upper molars in subadults widely open (dental pattern suggestive of that of Microtinae).
5. Palate extending posteriorly at least to end of tooth-rows. . . . . *Neotomodon*, p. 679
5′. Palate extending no farther posteriorly than level of anterior part of last molar.
6. Supraorbital ridge much elevated and strongly beaded; tympanic bullae much enlarged; their long axes parallel. . . . . *Xenomys*, p. 707
6′. Supraorbital ridge relatively little elevated and not beaded; tympanic bullae little enlarged, their long axes converging anteriorly. . . . . *Neotoma*, p. 681
4′. Folds of upper molars in subadults not widely open and areas of dentine less sharply projecting, making molars appear compressed. . . . . *Sigmodon*, p. 671
2′. Upper cheek-teeth not markedly specialized, the cuspidate pattern usually apparent; molars usually not flat-crowned.
7. Upper incisors conspicuously grooved. . . . . *Reithrodontomys*, p. 579
7′. Upper incisors not conspicuously grooved.
8. Cheek-teeth complex with subsidiary ridges normally present in main outer folds of M1 and M2; teeth cuspidate (secondary ridges tend to disappear in some species of *Peromyscus*).
9. Cusps of upper molars alternate; anterointernal cusp reduced to absent; M3 notably reduced. . . . . *Peromyscus*, p. 600
9′. Cusps of upper molars opposite or nearly so; anterointernal cusp not obliterated; M3 normally not reduced.
10. Pelage bristly or spiny. . . . . *Neacomys*, p. 571
10′. Pelage not bristly or spiny.
11. Anterointernal cusp of M1 much reduced.

12. Auditory bullae not greatly inflated, their greatest length less than 7. . . . *Nyctomys*, p. 577
12′. Auditory bullae greatly inflated ventrally, their greatest length more than 7. *Otonyctomys*, p. 579
11′. Anterointernal cusp of M1 but little reduced.
13. Palate not reaching posterior part of tooth-rows; lacking lateral pits in posterior part of palate.
14. Tail naked; frontals unusually wide; braincase heavily constructed; M3 similar to M2; subsidiary ridges of upper molars reduced.
15. Pits between cusps of upper molars markedly developed; tympanic bullae large. *Ototylomys*, p. 575
15′. Pits between cusps of upper molars not markedly developed; tympanic bullae small. *Tylomys*, p. 573
14′. Tail not naked; frontals of normal width; M3 more reduced than M2; subsidiary ridges of upper molars not or little reduced. . . . . *Rhipidomys*, p. 573
13′. Palate extending posteriorly beyond tooth-rows; palate having well marked lateral pits in posterior part of palate.
16. Cheek-teeth tending to become flat-crowned early; outer folds of upper molars isolated, or nearly so, on crown surface as islands early in life. . . . . *Nectomys*, p. 571
16′. Cheek-teeth not tending to become flat-crowned early; cusps usually present throughout life.
17. Braincase little wider than rostrum. . . . . *Megalomys*, p. 570
17′. Braincase much wider than rostrum. . . . . *Oryzomys*, p. 553
8′. Cheek-teeth not especially complex and subsidiary ridges in main outer folds of M1 and M2 not traceable.
18. Some part of backward prolongation of outer folds in upper molars isolated as deep, conspicuous pits between main cusps in all but greatly worn teeth. . . . . *Scotinomys*, p. 668
18′. No part of backward prolongation of outer folds in upper molars isolated as deep, conspicuous pits between main cusps in all but greatly worn teeth.
19. Cusps of upper molars high; molars narrow; M3 much reduced. . . . . *Onychomys*, p. 662
19′. Cusps of upper molars not high; molars not unusually narrow; M3 not greatly reduced.
20. Cusps of molars alternate; M3, at least in adult, ring-shaped. . . . . *Baiomys*, p. 659
20′. Cusps (when present) of molars opposite or nearly so; M3 not ring-shaped. *Zygodontomys*, p. 668

Genus Oryzomys Baird—Rice Rats

Revised by Goldman, N. Amer. Fauna, 43:1–100, 6 pls., 11 figs., September 23, 1918.

1858. *Oryzomys* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):458, July 14. Type, *Mus palustris* Harlan.

External measurements: 216–387; 101–235; 23–40. Form mouselike; pelage coarse but not bristly or spiny; tail usually long, annulations showing through sparse hairs. Skull lightly constructed and not markedly sculptured; zygomatic arches depressed to near level of tooth-row; palate extending posteriorly beyond tooth-rows; palatal pits present; tympanic bullae moderately inflated. Crowns of molars with well-developed cusps, styles, or tubercles, and main cusps opposite in two longitudinal series.

KEY TO NORTH AMERICAN SUBGENERA OF ORYZOMYS (adapted from Goldman, 1918b:17)

1. Tail slightly penicillate; zygomatic plate straight anteriorly. . . . . *Oecomys*, p. 569
1′. Tail not penicillate; zygomatic plate not straight anteriorly.
2. Lacrimal articulating approximately equally with frontal and maxilla anteriorly; tail approximately equal to or longer than head and body.
3. M2 with central enamel island normally elongate or absent; supraorbital and temporal ridges present; hind foot usually more than 25. . . . . *Oryzomys*, p. 553
3′. M2 with central enamel island usually circular; supraorbital and temporal ridges absent; hind foot usually less than 25. *Oligoryzomys*, p. 566
2′. Lacrimal articulating almost entirely with maxilla anteriorly; tail approximately three-fourths length of head and body. *Melanomys*, p. 568

Subgenus Oryzomys Baird—Rice Rats

1858. *Oryzomys* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):458, July 14. Type, *Mus palustris* Harlan.

Upper parts usually contrasting strongly with underparts; tail about equal to, or longer than, head and body; anterior border of lacrimal articulating about equally with maxilla and frontal; supraorbital and temporal ridges usually prominent; secondary parastyle (of Goldman, 1918b:Fig. 1) well developed; slightly worn crown of 2nd upper molar with central enamel island elongated or absent; upper incisors decidedly curved backward near points (after Goldman, 1918b:17).

KEY TO TYPICAL ADULTS OF SPECIES OF SUBGENUS ORYZOMYS
(after Goldman, 1918b:17–18)

1. Habitat North America and Greater Antilles.
   2. Hind foot without prominent tufts of digital bristles projecting beyond ends of three median claws.
      3. Habitat Rio Grande Valley south to Panamá, and including West Indies and islands near coasts of México.
         4. Habitat continental.
            5. Supraorbital ridges not projecting prominently over orbits.
               6. Head and shoulders not distinctly grayish.
                  7. Upper parts richer ochraceous-tawny (México). . . . . *O. fulgens*, p. 559
                  7′. Upper parts duller ochraceous-tawny or ochraceous-buffy (southern Texas to Panamá).
                     8. Texas into Costa Rica. . . . . *O. couesi*, p. 556
                     8′. Panamá. . . . . *O. azuerensis*, p. 559
               6′. Head and shoulders distinctly grayish (Baja California). . . . *O. peninsulae*, p. 559
            5′. Supraorbital ridges projecting prominently over orbits (Panamá). . . *O. gatunensis*, p. 560
         4′. Habitat insular.
            9. Habitat, islands off coasts of México.
               10. Upper parts ochraceous-buffy (María Madre Island). . . . . *O. nelsoni*, p. 559
               10′. Upper parts ochraceous-tawny (Cozumel Island). . . . . *O. cozumelae*, p. 559
            9′. Habitat, Greater Antilles (Jamaica). . . . . *O. antillarum*, p. 560
      3′. Habitat United States east of Rio Grande Valley. . . . . *O. palustris*, p. 554
   2′. Hind foot with prominent tufts of digital bristles projecting beyond ends of three median claws.
      11. Ears clothed externally with fine blackish hairs contrasting with color of head; hind foot long and narrow.
         12. Hind foot less than 33.
            13. Supraorbital vibrissae less than 40.
               14. Ears clothed internally with fine blackish hairs.
                  15. Second upper molar with central enamel island present; third lower molar with outer re-entrant angle extending approximately half way across crown. *O. alfaroi*, p. 561
                  15′. Second upper molar with central enamel island absent; third lower molar with outer re-entrant angle extending more than half way across crown (Costa Rica and Panamá). . . . . *O. talamancae*, p. 564
               14′. Ears clothed internally with buffy or rusty reddish hairs. . . *O. melanotis*, p. 560
            13′. Supraorbital vibrissae more than 50. . . . . *O. bombycinus*, p. 564
         12′. Hind foot 33 or more.
            16. Color paler (Costa Rica and western Panamá).
               17. Tail longer than 215; hind foot longer than 38; supraorbital ridges prominent. *O. aphrastus*, p. 565
               17′. Tail shorter than 215; hind foot shorter than 38; supraorbital ridges absent. *O. devius*, p. 565
            16′. Color darker (eastern Panamá). . . . . *O. pirrensis*, p. 565
      11′. Ears clothed externally with coarse tawny hairs not contrasting with color of head; hind foot short and broad (Costa Rica and Panamá). . . . . *O. tectus*, p. 565
1′. Habitat Lesser Antilles (St. Vincent). . . . . *O. victus*, p. 566

palustris-group

Oryzomys palustris

Marsh Rice Rat

External measurements: 226–305; 108–156; 28–37. Upper parts grizzled grayish brown to ochraceous-tawny, mixed with blackish; sides paler, with less black; underparts white to pale buff; tail varying from brownish above and whitish below to evenly dusky. Skull large; braincase high; rostrum short; frontal region broad, with trenchant lateral margins that are slightly upturned and project as supraorbital ridges; temporal ridges usually well developed; interparietal small, subtriangular; elongated palatal slits approximately as long as palatal bridge; palatal pits prominent; sphenopalatine vacuities large; inner re-entrant angles in upper molars and

outer re-entrant angles in lower molars reaching less than half way across moderately worn teeth.

The northern limit of range of this species seems to fluctuate, probably owing to fluctuation of population densities, and is less precisely known than for most common North American mammals.

Oryzomys palustris coloratus Bangs

1898. *Oryzomys palustris coloratus* Bangs, Proc. Boston Soc. Nat. Hist., 28:189, March, type from Cape Sable, Monroe Co., Florida.

1901. *Oryzomys natator floridanus* Merriam, Proc. Washington Acad. Sci., 3:277, July 26, type from Everglade, Collier Co., Florida.

MARGINAL RECORDS.—Florida: Eden (Sherman, 1937:119); thence southward around tip of peninsula to Everglade (*ibid.*); Lake Okeechobee [= Ritta] (Hamilton, 1943:295).

Oryzomys palustris natator Chapman

1893. *Oryzomys palustris natator* Chapman, Bull. Amer. Mus. Nat. Hist., 5:44, March 17, type from Gainesville, Alachua Co., Florida.

MARGINAL RECORDS (Sherman, 1937:118, unless otherwise noted).—Florida: Anastasia Island; Micco; Lake Kissimmee (Hamilton, 1955:85); Tarpon Key (Bush Key) (Fargo, 1929:205); Crystal River, Citrus Co.; type locality.

Oryzomys palustris palustris (Harlan)

1837. *Mus palustris* Harlan, Amer. Jour. Sci., 31:385. Type locality, "Fast Land," near Salem, Salem Co., New Jersey.

1858. *Oryzomys palustris* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):459, July 14.

?1854. *Arvicola oryzivora* Bachman, *in* Audubon and Bachman, The viviparous quadrupeds of North America, 3:214, type from St. Johns Parish, South Carolina.

MARGINAL RECORDS (Goldman, 1918b:24, unless otherwise noted).—Pennsylvania: Tinicum (Ulmer, 1951: 121–122). New Jersey: Cape May (*ibid.*), thence down coast to Florida: Burnside Beach (Sherman, 1937:118); New Berlin (*ibid.*); St. Marks (234374 BS). Mississippi: Biloxi, thence along east bank of Mississippi River through Tennessee to Missouri: Marble Hill. Illinois: Mt. Vernon Hill Country (Klimstra and Scott, 1956:1). Kentucky: Barbourville. Tennessee: Highcliff (Kellogg, 1939:282). South Carolina: Easley. North Carolina: Raleigh. Virginia: Brunswick County (Handley and Patton, 1947:167). Maryland: Nanjemoy Creek, 30 mi. SW Oxon Hill (Farner, 1947: 29); 2 mi. NW Oxon Hill (*ibid.*).

Guilday and Mayer-Oakes (1952:253–254) record bones of *Oryzomys* from Indian archaeological sites from several places including the following. Ohio: near Cincinnati; near Lebanon; near Chillicothe; near Portsmouth. West Virginia: 2 mi. NNE Oglebay Park. Pennsylvania: Fayette County; Somerset County. These occurrences are not shown on our Map 322.

Oryzomys palustris planirostris Hamilton

1955. *Oryzomys palustris planirostris* Hamilton, Proc. Biol. Soc. Washington, 68:83, August 3, type from one mile W of third bridge that spans Matachla Pass, Pine Island, Lee Co., Florida.

MARGINAL RECORDS (Hamilton, 1955:85).—Florida: 2 mi. N Fort Myers; type locality.

Oryzomys palustris sanibeli Hamilton

1955. *Oryzomys palustris sanibeli* Hamilton, Proc. Biol. Soc. Washington, 68:85, August 3, type from 4 mi. W of lighthouse on Sanibel Island, Lee Co., Florida. Known only from type locality.

Oryzomys palustris texensis J. A. Allen

1894. *Oryzomys palustris texensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:177, May 31, type from Rockport, Aransas Co., Texas.

MARGINAL RECORDS (Goldman, 1918b:28, unless otherwise noted).—?Kansas: Neosho Falls (Cockrum, 1952:

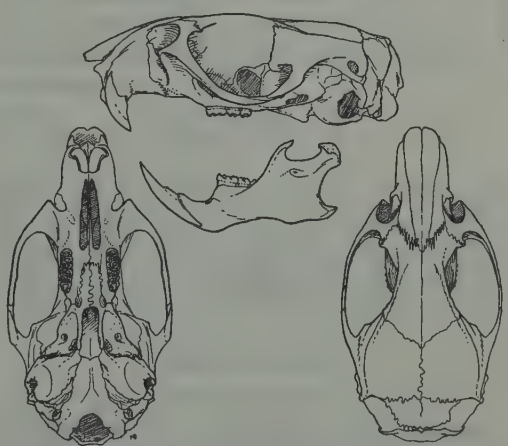
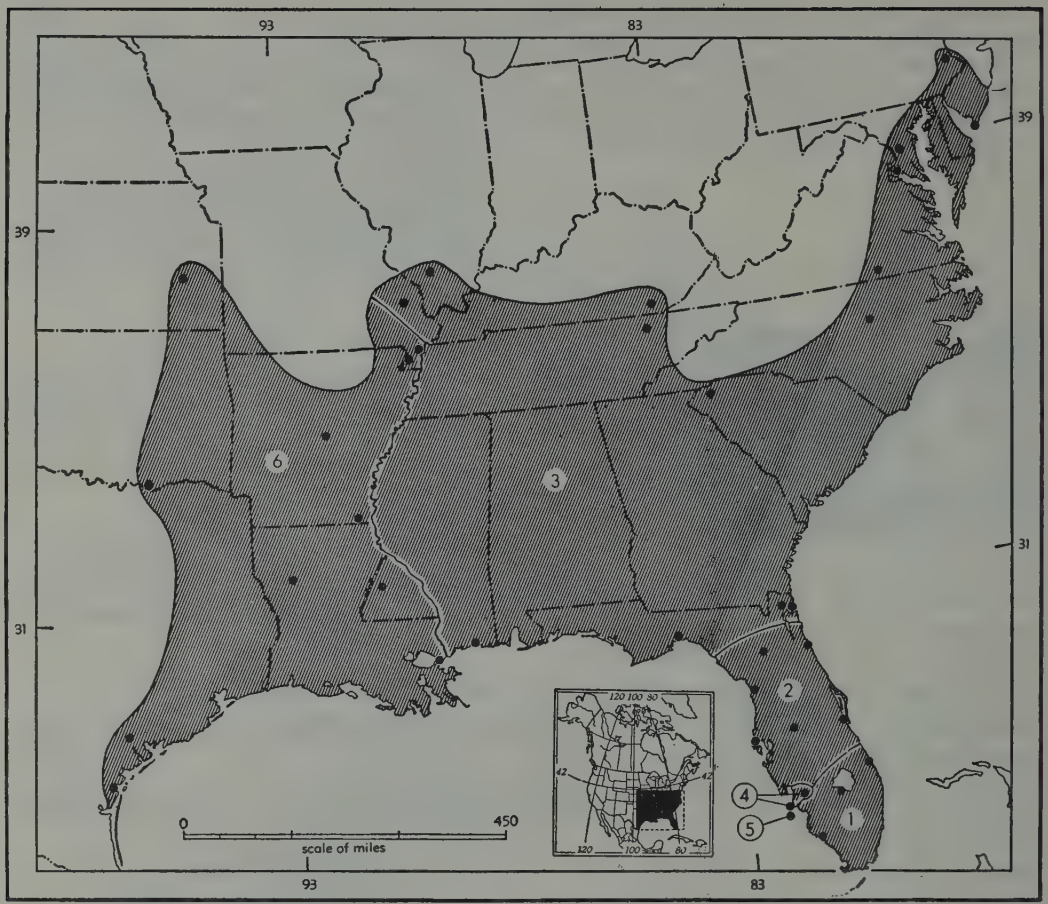


Fig. 314. *Oryzomys palustris palustris*, Goose Creek, Charleston Co., South Carolina, No. 97182 M.V.Z., ♂, X 1¼.



Map 322. *Oryzomys palustris.*

1. *O. p. coloratus*
2. *O. p. natator*
3. *O. p. palustris*
4. *O. p. planirostris*
5. *O. p. sanibeli*
6. *O. p. texensis*

281). Arkansas: Fourche Bayou, near Little Rock (Dellinger and Black, 1940:190). Missouri: Kennett; Portageville. Arkansas: Wilmot. Mississippi: Fayette. Louisiana: Lake Catherine (Lowery, 1936:29), thence westward along coast to Texas: *Padre Island* (Blair, 1952:241); Corpus Christi (*ibid.*); Victoria. Louisiana: Powhatan (Lowery, 1936:29). Oklahoma: 5 mi. N Colbert (McCarley, 1952:107).

Oryzomys couesi
Coues' Rice Rat

External measurements: 239–320; 127–180; 27–40. Upper parts varying from pinkish buff to ochraceous tawny, suffused with black, especially middorsally; underparts white to ochraceous buff; feet white; tail brownish above, white to buffy below. Skull much like that of *O. palustris* except that sphenopalatine vacuities are reduced or absent; infraorbital foramen with anterior border more rounded above, produced more anteriorly at base; interparietal with more pronounced posterior angle.

Oryzomys couesi albiventer Merriam

1901. *Oryzomys albiventer* Merriam, Proc. Washington Acad. Sci., 3:279, July 26, type from Ameca, 4000 ft., Jalisco.
1918. *Oryzomys couesi albiventer*, Goldman, N. Amer. Fauna, 43:38, September 23.

1903. *Oryzomys molestus* Elliot, Field Columb. Mus., Publ. 71, Zool. Ser., 3(8):145, March 20, type from Ocotlán, 5000 ft., Jalisco.

MARGINAL RECORDS.—Jalisco: 2 mi. N, ½ mi. W Guadalajara, 5200 ft. (31782 KU); La Barca (Goldman, 1918b:38); type locality.

Oryzomys couesi aquaticus J. A. Allen

1891. *Oryzomys aquaticus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:289, June 30, type from Brownsville, Cameron Co., Texas.
1918. *Oryzomys couesi aquaticus*, Goldman, N. Amer. Fauna, 43:39, September 23.

MARGINAL RECORDS.—Texas: Lomita Ranch (Blair, 1952:241); type locality. Tamaulipas: Matamoros (Goldman, 1918b:40); 70 km. by highway S of C. Victoria, 6 km. W of Pan-American Highway (Baker, 1951:215). Nuevo León: Río Ramos, 20 km. NW Montemorelos, 1000 ft. (Davis, 1944:398). Tamaulipas: Camargo (Goldman, 1918b:40).

Oryzomys couesi aztecus Merriam

1901. *Oryzomys crinitus aztecus* Merriam, Proc. Washington Acad. Sci., 3:282, July 26, type from Yautepec, Morelos.
1918. *Oryzomys couesi aztecus*, Goldman, N. Amer. Fauna, 43:35, September 23.

MARGINAL RECORDS.—Morelos: Cuernavaca (Davis and Russell, 1954: 76). Puebla: Tepanco, 1800 m. (Hooper, 1947:53); Tehuacán, 1700 m. (*ibid.*). Oaxaca: Teotitlán, 920–950 m. (*ibid.*); 3 km. NNE Cuicatlán, 570 m. (32033 KU); *1 km. S Cuicatlán, 590 m.* (29493 KU); *2 km. SSW Cuicatlán, 570 m.* (29494 KU). Guerrero: Tlalixtaquilla (Goldman, 1918b:36); Balsas (*ibid.*). Morelos: Puente de Ixtla (Davis and Russell, 1954:76).

Oryzomys couesi couesi (Alston)

1877. *Hesperomys couesi* Alston, Proc. Zool. Soc. London, for 1876, p. 756, April, type from Cobán, Guatemala.
1893. *O[ryzomys]. couesi*, Thomas, Ann. Mag. Nat. Hist., ser. 6, 11:403, May.
1897. *Oryzomys jalapae* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:206, June 16, type from Jalapa, 4400 ft., Veracruz.
1901. *Oryzomys jalapae rufinus* Merriam, Proc. Washington Acad. Sci., 3:285, July 26, type from Catemaco, 1000 ft., Veracruz.
1901. *Oryzomys teapensis* Merriam, Proc. Washington Acad. Sci., 3:286, July 26, type from Teapa, Tabasco.
1901. *Oryzomys goldmani* Merriam, Proc. Washington Acad. Sci., 3:288, July 26, type from Coatzacoalcos, Veracruz.
1904. *Oryzomys jalapae apatelius* Elliot, Field Columb. Mus., Publ. 90, Zool. Ser., 3:266, March 7, type from San Carlos, Veracruz.
1910. *Oryzomys richardsoni* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 28:99, April 30, type from Peña Blanca, Nicaragua.

MARGINAL RECORDS (Goldman, 1918b:31, unless otherwise noted).—Puebla: Metlaltoyuca. Veracruz: 5 km. N Jalapa, 5000 ft. (19662 KU); San Carlos, thence southward along coast at least to Honduras: Yaruca; Catacamas (Goodwin, 1942:164). Nicaragua: Río Tuma; Peña Blanca. Costa Rica: San Juanillo (Goodwin, 1946:391). Honduras: La Cienega (Goodwin, 1942:164); Las Flores (*ibid.*). Guatemala: Finca Cipres (Goodwin, 1934:46); Hda. California (*ibid.*). Chiapas: Finca Esperanza, 250 m. (Hooper, 1947: 53). Guatemala: Jacaltenango. Chiapas: Tumbalá. Tabasco: Teapa. Oaxaca: mountain near [= 15 mi. NE] Santo Domingo; Comaltepec; Tuxtepec. Veracruz: Orizaba. Puebla: Huauchinango.

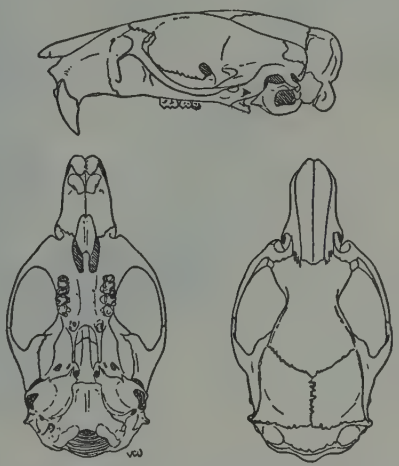


Fig. 315. *Oryzomys couesi couesi*, 30 km. SSE Jesús Carranza, 300 ft., Veracruz, No. 32148 K.U., ♂, X 1½.

Oryzomys couesi crinitus Merriam

1901. *Oryzomys crinitus* Merriam, Proc. Washington Acad. Sci., 3:281, July 26, type from Tlalpan, Distrito Federal, México.
1918. *Oryzomys couesi crinitus*, Goldman, N. Amer. Fauna, 43:36, September 23.

MARGINAL RECORDS.—Distrito Federal: type locality. Tlaxcala: 8 km. SW Tlaxcala, 7500 ft. (Davis, 1944:398).

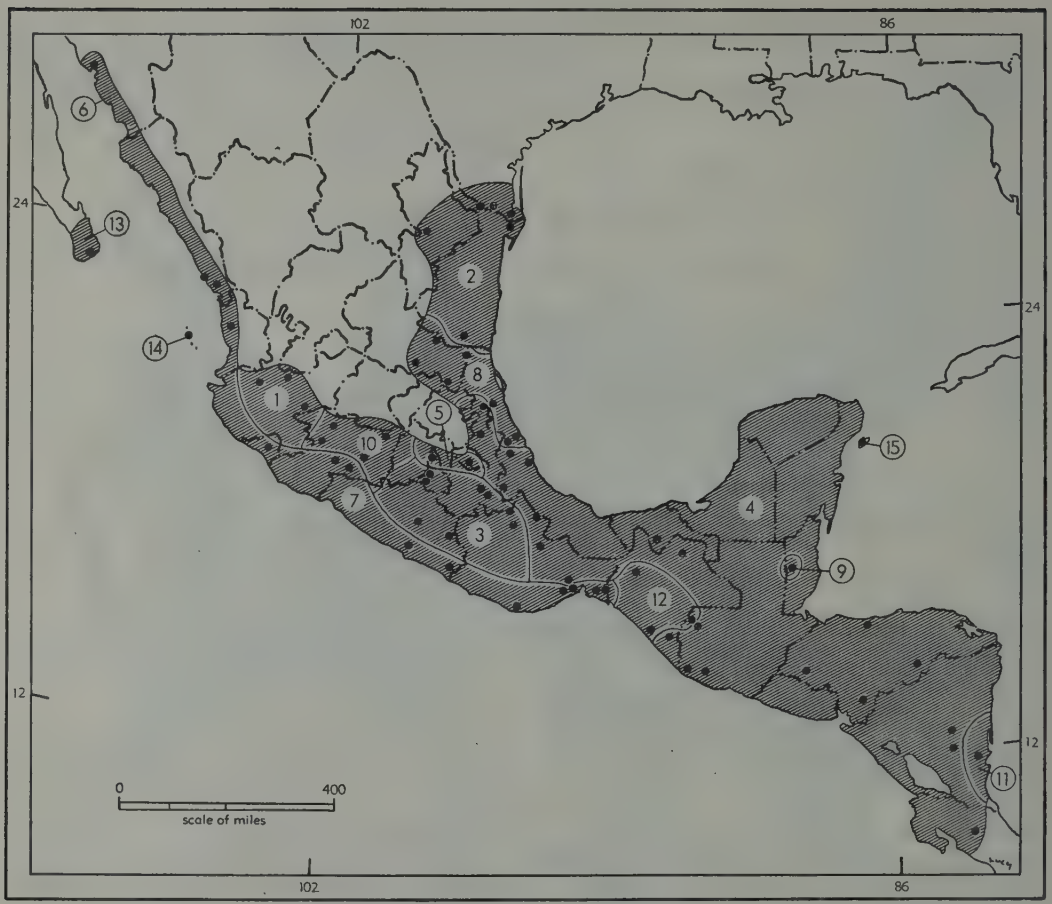
Oryzomys couesi lambi Burt

1934. *Oryzomys couesi lambi* Burt, Proc. Biol. Soc. Washington, 47:107, June 13, type from San José de Guaymas, Sonora. Known only from the type locality.

Oryzomys couesi mexicanus J. A. Allen

1897. *Oryzomys mexicanus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:52, March 15, type from Hacienda San Marcos, 3500 ft., Tonila, Jalisco.
1918. *Oryzomys couesi mexicanus*, Goldman, N. Amer. Fauna, 43:33, September 23.
1897. *Oryzomys bulleri* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:53, March 15, type from Valle de Banderas, Nayarit.
1901. *Oryzomys rufus* Merriam, Proc. Washington Acad. Sci., 3:287, July 26, type from Santiago, 200 ft., Nayarit.

MARGINAL RECORDS (Goldman, 1918b:35, unless otherwise noted).—Sinaloa: Mazatlán; *Chele* (Hooper, 1955: 20); Rosario. Nayarit: Santiago. Colima: Hda. Magdalina. Michoacán: 10 km. W Apatzingán, 1040 ft. (Hall and Villa,



Map 323. *Oryzomys couesi* and other species.

1. *O. couesi albiventer*
2. *O. couesi aquaticus*
3. *O. couesi aztecus*
4. *O. couesi couesi*
5. *O. couesi crinitus*
6. *O. couesi lambi*
7. *O. couesi mexicanus*
8. *O. couesi peragrus*
9. *O. couesi pinicola*
10. *O. couesi regillus*
11. *O. couesi richmondi*
12. *O. couesi zygomaticus*
13. *O. peninsulae*
14. *O. nelsoni*
15. *O. cozumelae*

1949:465); La Huacana. Guerrero: Río Aquacatillo, 30 km. N Acapulco, 1000 ft. (Davis, 1944:398); Ometepec. Oaxaca: Pluma [Hidalgo]; Tehuantepec; Juchitán; Reforma (Hall and Kelson, 1952:370); Santa Efigenia, thence northward along coast to point of beginning.

Oryzomys couesi peragrus Merriam

1901. *Oryzomys mexicanus peragrus* Merriam, Proc. Washington Acad. Sci., 3:283, July 26, type from Río Verde, San Luis Potosí.

1918. *Oryzomys couesi peragrus*, Goldman, N. Amer. Fauna, 43:39, September 23.

MARGINAL RECORDS.—San Luis Potosí (Dalquest, 1953b:123): El Salto; Ebano. Veracruz: 3 km. SW San Marcos, 200 ft. (24051 KU); 4 km. W Tlapacoyan, 1700 ft. (24053 KU); 5 km. S Tihuatlán, 700 ft. (24049 KU). San Luis Potosí: 3 km. N Tamazunchale (Dalquest, 1953b:124); type locality.

Oryzomys couesi pinicola A. Murie

1932. *Oryzomys couesi pinicola* A. Murie, Occas. Papers Mus. Zool., Univ. Michigan, 245:1, June 9, type from a pine ridge, 12 mi. S El Cayo, British Honduras. Known only from the type locality.

Oryzomys couesi regillus Goldman

1915. *Oryzomys couesi regillus* Goldman, Proc. Biol. Soc. Washington, 28:129, June 29, type from Los Reyes, Michoacán.

MARGINAL RECORDS (Hall and Villa, 1949:464, unless otherwise noted).—1 mi. N Zamora, 5450 ft.; Queréndaro (Goldman, 1918b:37); 1 mi. E, 6 mi. S Tacámbaro, 4000 ft.; type locality; *4 mi. W Zamora, 5450 ft.*

Oryzomys couesi richmondi Merriam

1901. *Oryzomys richmondi* Merriam, Proc. Washington Acad. Sci., 3:284, July 26, type from Escondido River, 50 miles above Bluefields, Nicaragua.
1918. *Oryzomys couesi richmondi*, Goldman, N. Amer. Fauna, 43:32, September 23.

MARGINAL RECORDS.—Nicaragua: type locality; *Escondido River, 16 mi. above Bluefields* (Goldman, 1918b: 32).

Oryzomys couesi zygomaticus Merriam

1901. *Oryzomys zygomaticus* Merriam, Proc. Washington Acad. Sci., 3:285, July 26, type from Nentón, Guatemala.
1918. *Oryzomys couesi zygomaticus*, Goldman, N. Amer. Fauna, 43:32, September 23.

MARGINAL RECORDS.—Chiapas: Ocuilapa (Goldman, 1918b:33). Guatemala: type locality. Chiapas: 1 km. S Mapastepec, 46 m. (Villa, 1949:517).

Oryzomys peninsulae Thomas
Baja California Rice Rat

1897. *Oryzomys peninsulae* Thomas, Ann. Mag. Nat. Hist., ser. 6, 20:548, December, type from Santa Anita, Baja California.

External measurements: 270–305; 138–156; 31.5–34.0. Upper parts between warm buff and pale ochraceous-buff, becoming buffy gray on head, forelegs, shoulders, and sides; hairs of underparts plumbeous basally with white tips except on chin and throat where hairs are white basally; feet white; tail light brown above, yellowish below but darker distally. Skull broad, arched; interparietal large; premaxillary tongues extending posteriorly well beyond nasals; sphenopalatine vacuities unusually large.

MARGINAL RECORDS.—Baja California: type locality; *San José del Cabo* (Goldman, 1918b:46).

Oryzomys fulgens Thomas
Thomas' Rice Rat

1893. *Oryzomys fulgens* Thomas, Ann. Mag. Nat. Hist., ser. 6, 11:403, May, type from "México." Probably in or near the Valley of Mexico. No other referred specimens.

Measurements of dry skin of type are: head and body, 160; tail, 151; hind foot, 37.5. This species has not been critically compared with other species of *Oryzomys* by recent workers, and its status is doubtful. To judge from the original characterization, salient characteristics are; bright fulvous upper parts; anterior half of upper parts paler and duller than posterior half [molt?]; broad skull; inner wall of orbit forms one even curve; premaxillary processes barely reaching posterior level of nasals. Not shown on a distribution map.

Oryzomys nelsoni Merriam
Nelson's Rice Rat

1898. *Oryzomys nelsoni* Merriam, Proc. Biol. Soc. Washington, 12:15, January 27, type from María Madre Island, Tres Marías Islands, Nayarit. Known only from type locality.

External measurements of 2 adults are: 320, 344; 185, 191; 37, 39. Upper parts rich ochraceous buff, richest on rump, darkened dorsally by black hairs; underparts white; tail light brown above and, distally, below, but yellowish below basally. Skull massive, long, narrow; rostrum massive, strongly decurved; zygomata heavy.

Oryzomys cozumelae Merriam
Cozumel Island Rice Rat

1901. *Oryzomys cozumelae* Merriam, Proc. Biol. Soc. Washington, 14:103, July 19, type from Cozumel Island, Quintana Roo. Known only from Cozumel Island.

External measurements: 285–332; 163–182; 33–35.5. Upper parts approximately ochraceous tawny, sometimes darker, mixed with brownish hairs; underparts buffy; tail dark brown above, yellowish below basally and dusky distally. Skull resembling that of *O. couesi*, but slightly larger.

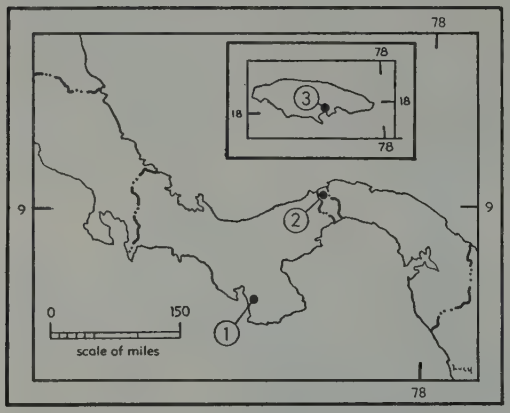
This nominal species is separated from *O. couesi* almost wholly on the basis of larger size and relatively longer tail.

Oryzomys azuerensis Bole
Azuero Rice Rat

1937. *Oryzomys azuerensis* Bole, Sci. Publ. Cleveland Mus. Nat. Hist., 7:165, August 31, type from Paracoté, 1½ mi. S mouth Río Angulo, Mariato-Suay Lands, Veraguas, Panamá. Known only by the type specimen.

External measurements: 203; 107.5; 30. Upper parts rich brown, lighter on cheeks and sides of neck, darker on head; underparts pale gray with ochraceous suffusion; tail dark brown above, paler below except at tip. Skull short, broad; supraorbital ridges prominent; nasals exceeding premaxillary tongues in posterior extension.

This nominal species seems to be a geographic outlier of *O. couesi.*



Map 324. Three species of *Oryzomys.*

Guide to species
1. *O. azuerensis*
2. *O. gatunensis*
3. *O. antillarum*

Oryzomys gatunensis Goldman
Gatún Rice Rat

1912. *Oryzomys gatunensis* Goldman, Smiths. Miscl. Coll., 56(36):7, February 19, type from Gatún, Canal Zone, Panamá. Known only from the type locality.

Measurements of the type, a two-thirds grown individual, are: 224; 115; 14.5. Upper parts near ochraceous tawny, much darkened middorsally by admixture of black hairs; underparts light ochraceous buff; tail light brown above, paler below. Skull resembling that of *O. c. richmondi,* but frontal region broader, lateral margins more developed as supraorbital shelves; interparietal much less extended anteroposteriorly; nasals more prolonged posteriorly beyond premaxillae (after Goldman, 1918b:42).

Oryzomys antillarum Thomas
Jamaican Rice Rat

1898. *Oryzomys antillarum* Thomas, Ann. Mag. Nat. Hist., ser. 7, 1:177, February, type from Jamaica. Known only from Jamaica.

This species is known from only a few specimens and none has been obtained since 1877. None was measured in the flesh, but measurements of dry skins closely correspond to those of *O. couesi,* which *antillarum* closely resembles in other respects. The upper parts are described as rufous with the middorsal area not conspicuously darker than the rest; underparts dull yellowish. Skull "resembling that of *O. c. couesi,* but nasals reaching farther posteriorly beyond premaxillae . . . ; maxillary arm of zygoma heavier; anterior palatine foramina shorter than usual in *couesi.* . . ." (Goldman, 1918b:44.)

melanotis-group

Oryzomys melanotis
Black-eared Rice Rat

External measurements: 216–277; 116–145; 26–33. Upper parts varying from ochraceous-buff to slightly paler, in worn adults sometimes becoming rusty red; underparts white with buffy suffusion, the basal gray usually showing through; pale-colored subauricular spot present; tail brownish above, paler below except at tip. Skull differs from that of *O. palustris* as follows: rostrum longer, anterior palatine foramina shorter in relation to palatal bridge, auditory bullae smaller, and m3 more deeply incised by outer re-entrant angle.

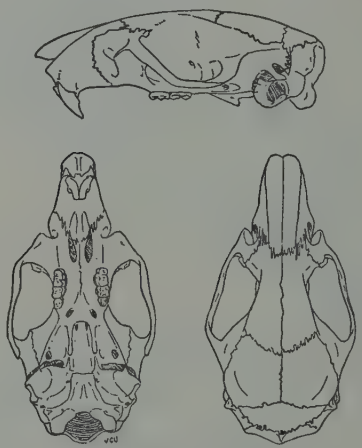


Fig. 316. *Oryzomys melanotis rostratus,* Potrero Llano, 350 ft., Veracruz, No. 30540 K.U., ♂, X 1⅓.

Oryzomys melanotis carrorum Lawrence

1947. *Oryzomys rostratus carrorum* Lawrence, Proc. New England Zool. Club, 24:101, May 29, type from Rancho Santa Ana, about 8 mi. SW Padilla, Río Soto la Marina, Tamaulipas. Known only from type locality.

Oryzomys melanotis colimensis Goldman

1918. *Oryzomys melanotis colimensis* Goldman, N. Amer. Fauna, 43:51, September 23, type from Armería, Colima.

MARGINAL RECORDS.—Jalisco: 5 mi. NE Barra de Navidad, 200 ft. (40148 KU); *20 mi. SSE Autlán, 6500 ft.* (Hooper, 1955:20). Colima: Hda. Magdalena (Goldman, 1918b:52). Michoacán: 16 mi. S Arteaga, 800 ft. (40131 KU), thence northward along coast to point of beginning.

Map 325. *Oryzomys melanotis.*

1. *O. melanotis carrorum*
2. *O. melanotis colimensis*
3. *O. melanotis megadon*
4. *O. melanotis melanotis*
5. *O. melanotis rostratus*
6. *O. melanotis yucatanensis*

Oryzomys melanotis megadon Merriam

1901. *Oryzomys rostratus megadon* Merriam, Proc. Washington Acad. Sci., 3:294, July 26, type from Teapa, Tabasco.

MARGINAL RECORDS (Goldman, 1918b:55).—Campeche: Champotón; Apazote. Tabasco: type locality.

Oryzomys melanotis melanotis Thomas

1893. *Oryzomys melanotis* Thomas, Ann. Mag. Nat. Hist., ser. 6, 11:404, May, type from Mineral San Sebastián, Jalisco.

MARGINAL RECORDS (Goldman, 1918b:51).—Sinaloa: Los Limones. Nayarit: Santiago. Jalisco: type locality; Ixtapa.

Oryzomys melanotis rostratus Merriam

1901. *Oryzomys rostratus* Merriam, Proc. Washington Acad. Sci., 3:293, July 26, type from Metlaltoyuca, Puebla.
1953. *Oryzomys melanotis rostratus,* Hooper, Occas. Papers Mus. Zool., Univ. Michigan, 544:8, March 25.

MARGINAL RECORDS (Goldman, 1918b:54, unless otherwise noted).—Tamaulipas: 70 km. by highway S Ciudad Victoria, 2 km. W El Carrizo (Baker, 1951:216); Altamira. Veracruz: 3 km. E San Andrés Tuxtla, 1000 ft. (24099 KU); 20 km. SE Jesús Carranza, 300 ft. (24105 KU). Oaxaca: mountains near [12 mi. NE] Santo Domingo. Veracruz: Pasa Nueva; Motzorongo. Puebla: type locality. San Luis Potosí: 3 km. N Tamazunchale (Dalquest, 1953b: 125); El Salto (*ibid.*).

Oryzomys melanotis yucatanensis Merriam

1901. *Oryzomys yucatanensis* Merriam, Proc. Washington Acad. Sci., 3:294, July 26, type from Chichén-Itzá, Yucatán.
1918. *Oryzomys rostratus yucatanensis,* Goldman, N. Amer. Fauna, 43:55, September 23.

MARGINAL RECORDS.—Quintana Roo: Puerto Morelos (Goldman, 1918b:55); Esmeralda (35203 KU). Yucatán: type locality.

alfaroi-group

Oryzomys alfaroi

Alfaro's Rice Rat

External measurements: 195–257; 101–141; 23–30. Upper parts varying from dark ochraceous buff to ochraceous tawny, or even brownish, usually with admixture of black, especially on head and middorsally; underparts white, usually with buffy suffusion, plumbeous basal color usually showing through; tail sparsely haired, brownish above, paler below, becoming dusky above and below distally. Skull relatively elongated; braincase relatively vaulted.

Oryzomys alfaroi alfaroi (J. A. Allen)

1891. *Hesperomys* (*Oryzomys*) *alfaroi* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:214, April 17, type from San Carlos, Costa Rica.

1894. *Oryzomys alfaroi* J. A. Allen, Abstr. Proc. Linn. Soc. New York, 1893–1894, p. 36, July 20.
1908. *Oryzomys alfaroi incertus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:655, October 13, type from Río Grande, Zelaya, Nicaragua.

MARGINAL RECORDS.—Guatemala: Uaxactún (Murie, 1935:26). British Honduras: near Mountain Pine Ridge, 12 mi. S El Cayo (Murie, 1932:1); Bokowina (Laurie, 1953: 387). Honduras: Yaruca (Goldman, 1918b:61). Nicaragua: Tuma (*ibid.*). Costa Rica: Santa Teresa Peralta (Goodwin, 1946:391). Panamá: Boquete (Goldman, 1920:97). Costa Rica (Goodwin, 1946:391–392): Agua Buena, Puntarenas; Hda. Santa María. Nicaragua (Goldman, 1918b:61): Jinotega; Jícaro.

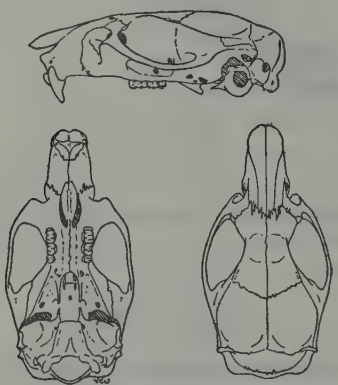


Fig. 317. *Oryzomys alfaroi chapmani*, 4 km. W Tlapacoyan, 1700 ft., Veracruz, No. 24107 K.U., ♀, X 1½.

Oryzomys alfaroi angusticeps Merriam

1901. *Oryzomys angusticeps* Merriam, Proc. Washington Acad. Sci., 3:292, July 26, type from Volcán Santa María, 9000 ft., Guatemala.
1918. *Oryzomys alfaroi angusticeps*, Goldman, N. Amer. Fauna, 43:62, September 23.

MARGINAL RECORDS.—Chiapas (Goldman, 1918b: 63): San Cristóbal. Guatemala (Goodwin, 1934:46): San Lucas; *Volcán San Lucas*; Finca Cipres. Chiapas: Pinabete (Goldman, 1918b:63); Triunfo, 1950 m. (Villa, 1949: 518); Catarina, 1300 m. (*ibid.*).

Oryzomys alfaroi caudatus Merriam

1901. *Oryzomys chapmani caudatus* Merriam, Proc. Washington Acad. Sci., 3:289, July 26, type from Comaltepec, 3500 ft., Oaxaca.
1918. *Oryzomys alfaroi caudatus*, Goldman, N. Amer. Fauna, 43:64, September 23.

MARGINAL RECORDS.—Oaxaca: type locality; Totontepec (Goldman, 1918b:65).

Oryzomys alfaroi chapmani Thomas

1898. *Oryzomys chapmani* Thomas, Ann. Mag. Nat. Hist., ser. 7, 1:179, February, type from Jalapa, 4400 ft., Veracruz.
1918. *Oryzomys alfaroi chapmani*, Goldman, N. Amer. Fauna, 43:67, September 23.

MARGINAL RECORDS.—Veracruz: 4 km. W Tlapacoyan, 1700 ft. (24106 KU); type locality; Mirador, 3500 ft. (24108 KU); Coscomatepec, 5000 ft. (30547 KU); 1 km. E Jalacingo, 6500 ft. (30552 KU).

Oryzomys alfaroi dariensis Goldman

1915. *Oryzomys alfaroi dariensis* Goldman, Proc. Biol. Soc. Washington, 28:128, June 29, type from Cana, 2000 ft., eastern Panamá.

MARGINAL RECORDS.—Panamá: Mt. Tacarcuna (Goldman, 1920:98); type locality.

Oryzomys alfaroi dilutior Merriam

1901. *Oryzomys chapmani dilutior* Merriam, Proc. Washington Acad. Sci., 3:290, July 26, type from Huauchinango, 5000 ft., Puebla.
1918. *Oryzomys alfaroi dilutior*, Goldman, N. Amer. Fauna, 43:68, September 23.

MARGINAL RECORDS.—Hidalgo: 16 km. NW Jacala, 1550 m. (Baker and Villa, 1953:149). Puebla: type locality.

Oryzomys alfaroi gloriaensis Goodwin

1956. *Oryzomys alfaroi gloriaensis* Goodwin, Amer. Mus. Novit., 1757:8, March 8, type from La Gloria, rain forest, about 2500 ft., 10 km. S Santa María Chimalapa, District of Juchitán, Oaxaca.

MARGINAL RECORDS.—Oaxaca (Goodwin, 1956a: 8–9): Petapa, Mazatlán; type locality.

Oryzomys alfaroi guerrerensis Goldman

1915. *Oryzomys guerrerensis* Goldman, Proc. Biol. Soc. Washington, 28:127, June 29, type from Omilteme, 8000 ft., Guerrero.

MARGINAL RECORDS.—Guerrero: type locality. Oaxaca: Río Grande (Goodwin, 1956:9, as *O. alfaroi gloriaensis*—but, see next sentence); Pluma [Hidalgo] (Goldman, 1918b:70). On March 12, 1957, G. G. Goodwin and E. R. Hall examined the specimen from Río Grande. It is No. 165024 Amer. Mus. Nat. Hist., sex in question, a stuffed skin with skull, prepared from an animal preserved in alcohol. The molars are only slightly worn. Alcohol had altered the color of the pelage but in life the pelage certainly was darker than in *O. guerrerensis* and perhaps paler than in *O. a. gloriaensis*. The animal was smaller than *O. a. gloriaensis* and no larger than, if as large as, *O. guerrerensis*. It was concluded that the specimen was (1) an intergrade between *O. alfaroi gloriaensis* to the east and *O. guerrerensis* to the west, (2) is referable to *guerrerensis*, and (3) gives basis for arranging *O. guerrerensis* as a subspecies of *O. alfaroi*.

Oryzomys alfaroi huastecae Dalquest

1951. *Oryzomys alfaroi huastecae* Dalquest, Jour. Washington Acad. Sci., 41:363, November 14, type from 10 km. E Platanito, San Luis Potosí.

Map 326. *Oryzomys alfaroi.*

Guide to subspecies
1. *O. a. alfaroi*
2. *O. a. angusticeps*
3. *O. a. caudatus*
4. *O. a. chapmani*
5. *O. a. dariensis*
6. *O. a. dilutior*
7. *O. a. gloriaensis*
8. *O. a. guerrerensis*
9. *O. a. huastecae*
10. *O. a. hylocetes*
11. *O. a. palatinus*
12. *O. a. rhabdops*
13. *O. a. saturatior*

MARGINAL RECORDS (Dalquest, 1953b:126, unless otherwise noted).—Tamaulipas: Rancho del Cielo (Goodwin, 1954:10, as *O. a. dilutior*). San Luis Potosí: type locality; 3 km. N Valles; Xilitla.

Oryzomys alfaroi hylocetes Merriam

1901. *Oryzomys hylocetes* Merriam, Proc. Washington Acad. Sci., 3:291, July 26, type from Chicharras, 3500 ft., Chiapas.
1949. *Oryzomys alfaroi hylocetes*, Villa, Anal. Inst. Biol., Univ. Nac. México, 19(2):518, June 30.

MARGINAL RECORDS.—Chiapas (Villa, 1949:518): Finca Liquidámbar, 1210 m.; type locality; *Finca Prusia, 1200 m.*

Oryzomys alfaroi palatinus Merriam

1901. *Oryzomys palatinus* Merriam, Proc. Washington Acad. Sci., 3:290, July 26, type from Teapa, 3000 ft., Tabasco.
1918. *Oryzomys alfaroi palatinus*, Goldman, N. Amer. Fauna, 43:65, September 23.

MARGINAL RECORDS.—Veracruz: 20 km. ENE Jesús Carranza, 200 ft. (32149 KU). Tabasco: type locality. Chiapas: Ocuilapa (Goldman, 1918b:66). Veracruz: 25 km. SE Jesús Carranza, 250 ft. (32150 KU).

Oryzomys alfaroi rhabdops Merriam

1901. *Oryzomys rhabdops* Merriam, Proc. Washington Acad Sci., 3:291, July 26, type from Calel, 10,000 ft., Guatemala. Known only from the type locality.
1918. *Oryzomys alfaroi rhabdops*, Goldman, N. Amer. Fauna, 43:63, September 23.

Oryzomys alfaroi saturatior Merriam

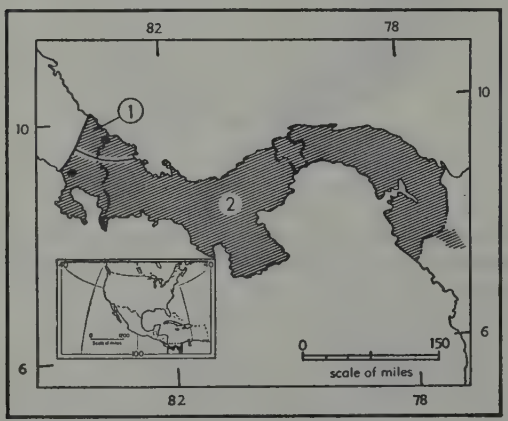
1901. *Oryzomys chapmani saturatior* Merriam, Proc. Washington Acad. Sci., 3:290, July 26, type from Tumbalá, 5000 ft., Chiapas.

1918. *Oryzomys alfaroi saturatior,* Goldman, N. Amer. Fauna, 43:66, September 23.

MARGINAL RECORDS.–Chiapas: type locality; *Laguna Ocotal* (Burnett and Lyman, 1957:294, as *O. a. palatinus*). Guatemala: Chimoxan (Goodwin, 1934:47). Honduras (Goodwin, 1942:165): La Mica; Cantoral; Muya; Monte Verde. Guatemala: El Soche (Goodwin, 1934:47).

talamancae-group
Oryzomys talamancae
Talamancan Rice Rat

External measurements: 233–265; 115–133; 29–30.5. Color essentially as in *O. alfaroi.* Skull large; braincase somewhat flattened; maxillary arm of zygoma robust; nasals and premaxillary tongues approximately coterminous posteriorly; frontals broad, trenchant laterally, and depressed anteromedially; interparietal large; palatal pits small; anterior palatine slits much shorter than palatal bridge; tympanic bullae small; in molars, inner and outer re-entrant angles above and below deep.



Map 327. *Oryzomys talamancae.*

1. *O. t. carrikeri* 2. *O. t. talamancae*

Oryzomys talamancae carrikeri J. A. Allen

1908. *Oryzomys carrikeri* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:656, October 13, type from banks of Río Sicsola [= Sixaola], between Cuabre and mouth of Río Sixaola, Limón, Costa Rica. Known only from the type locality.
1946. *Oryzomys talamancae carrikeri,* Goodwin, Bull. Amer. Mus. Nat. Hist., 87:392, December 31.

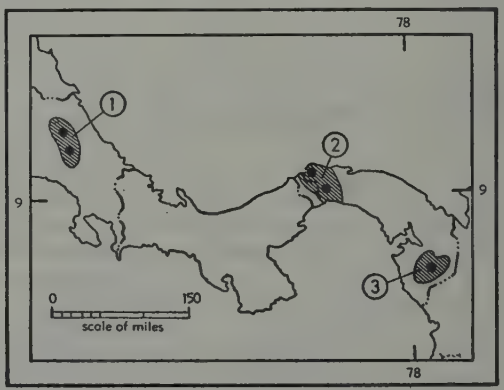
Oryzomys talamancae talamancae J. A. Allen

1891. *Oryzomys talamancae* J. A. Allen, Proc. U.S. Nat. Mus., 14:193, July 24, type from Talamanca, Limón, Costa Rica.
1901. *Oryzomys panamensis* Thomas, Ann. Mag. Nat. Hist., ser. 7, 8:252, September, type from Panamá, Panamá.

MARGINAL RECORDS.–Costa Rica: Boruca (Goodwin, 1946:392), thence southward into South America.

bombycinus-group
Oryzomys bombycinus
Silky Rice Rat

External measurements: 218–252; 111–127; 29–32. Appendages long, slender, and nearly naked. Pelage of upper parts long (about 12 mm. on back); underfur not wooly (as in, for example, *O. palustris*); upper parts approximately cinnamon brown or russet; underparts washed with white; rostrum long, narrow; nasals extending posteriorly to tips of premaxillary tongues; braincase broad; zygomata slender; frontal region broad, flattened, somewhat depressed anteromedially; distinct but narrow supraorbital ridges; palatal pits small; anterior palatine slits short; sphenopalatine vacuities small to absent; tympanic bullae small; crowns of molars deeply incised by re-entrant angles; mandibular tooth-row conspicuously narrowed posteriorly.



Map 328. *Oryzomys bombycinus.*

1. *O. b. alleni* 2. *O. b. bombycinus* 3. *O. b. orinus*

Oryzomys bombycinus alleni Goldman

1915. *Oryzomys nitidus alleni* Goldman, Proc. Biol. Soc. Washington, 28:128, June 29, type from Tuís, about 20 mi. E Cartago, Cartago, Costa Rica.
1918. *Oryzomys bombycinus alleni* Goldman, N. Amer. Fauna, 43:78, September 23.

MARGINAL RECORDS.–Costa Rica: Guápiles (Goodwin, 1946:393); type locality.

Oryzomys bombycinus bombycinus Goldman

1912. *Oryzomys bombycinus* Goldman, Smiths. Miscl. Coll., 56(36):6, February 19, type from Cerro Azul, 2500 ft., near headwaters of Chagres River, Panamá.

MARGINAL RECORDS.—Panamá: Cerro Brujo (Goldman, 1920:98); type locality.

Oryzomys bombycinus orinus Pearson

1939. *Oryzomys bombycinus orinus* Pearson, Not. Naturae, Acad. Nat. Sci. Philadelphia, 6:2, June 8, type from Mt. Pirri, near Río Limón, Darién, Panamá. Known only from the type locality.

devius-group

Oryzomys aphrastus Harris
Harris' Rice Rat

1932. *Oryzomys aphrastus* Harris, Occas. Papers Mus. Zool., Univ. Michigan, 248:5, August 4, type from San Joaquin de Dota, about 4000 ft., San José, Costa Rica. Known only from the type locality.

Measurements and description of the type (Harris, 1932:5–6) are: total length, 387; tail, 235; hind foot, 40. Upper parts "very dark grizzled yellowish brown. Sides and flanks paler and more Ochraceous-Buff. . . . Tail blackish both above and below with tuft of black hairs at the tip. Feet dark brownish black. . . . Hairs of underparts lead gray at base tipped with Ochraceous-Buff." Skull long, narrow; supraorbital and temporal ridges prominent; audital bullae small; nasals extend posterior to premaxillary tongues.

The systematic position of this "species" is doubtful. Our assignment of it to the *devius*-group is provisional.

Oryzomys devius Bangs
Boquete Rice Rat

1902. *Oryzomys devius* Bangs, Bull. Mus. Comp. Zool., 39: 34, April, type from Boquete, 5000 ft., Volcán de Chiriquí, Chiriquí, Panamá.

External measurements of type and 2 topotypes are, respectively: 335, 345, 360; 180, 185, 195; 33, 36, 35. Upper parts dark tawny, heavily mixed with black; throat whitish; remaining underparts whitish to ochraceous buffy; tail (skin) dark brown above, paler below. Skull large; rostrum long, heavy; nasals extending slightly posterior to premaxillaries; zygomata massive; frontals narrow; supraorbital ridges weak or absent; interparietal large; anterior palatine pits especially short; palatal pits large; sphenopalatine vacuities absent; crowns of molars deeply incised by re-entrant angles; mandibular tooth-row conspicuously narrow posteriorly.

MARGINAL RECORDS (Goodwin, 1946:394).—Costa Rica: Lajas Villa Quesada; Estrella. Panamá: type locality. Costa Rica: El Muñeco.

Map 329. Three species of *Oryzomys*.
1. *O. aphrastus* 2. *O. devius* 3. *O. pirrensis*

Oryzomys pirrensis Goldman
Mt. Pirri Rice Rat

1913. *Oryzomys pirrensis* Goldman, Smiths. Miscl. Coll., 60(22):5, February 28, type from near head of Río Limón, Mt. Pirri, 4500 ft., Panamá.

External measurements: 309–340; 159–185; 34–38. Color essentially as in *O. devius* but slightly darker. Skull resembling that of *devius* but more angular; nasals shorter; zygomata more widely spreading; tympanic bullae decidedly smaller.

MARGINAL RECORDS.—Panamá: Mt. Tacarcuna (Goldman, 1920:101); type locality.

tectus-group

Oryzomys tectus
Panamá Rice Rat

External measurements of *O. t. tectus* are: 281–309; 152–164; 26.5–30. Upper parts approximately ochraceous tawny, but variable, with thin admixture of dusky hairs; underparts variable from pure white to warm buff; tail either dark brownish above and below or brown above and whitish or yellowish below. Skull large; frontal region conspicuously broad; frontals projecting laterally over orbits to marked degree.

Oryzomys tectus frontalis Goldman

1912. *Oryzomys frontalis* Goldman, Smiths. Miscl. Coll., 56(36):6, February 19, type from Corozal, Canal Zone, Panamá.
1918. *Oryzomys tectus frontalis* Goldman, N. Amer. Fauna, 43:85, September 23.

MARGINAL RECORDS (Goldman, 1920:101).—Panamá: type locality; Tacarcuna; Cana.

Map 330. *Oryzomys tectus.*

1. *O. t. frontalis* 2. *O. t. tectus*

Oryzomys tectus tectus Thomas

1901. *Oryzomys tectus* Thomas, Ann. Mag. Nat. Hist., ser. 7, 8:251, September, type from Bogava [= Bugaba], 800 ft., Chiriquí, Panamá.

MARGINAL RECORDS.—Costa Rica: San Gerónimo de Pirrís (Goodwin, 1946:395). Panamá: type locality.

Map 331. *Oryzomys victus.*

Oryzomys victus Thomas
St. Vincent Rice Rat

1898. *Oryzomys victus* Thomas, Ann. Mag. Nat. Hist., ser. 7, 1:178, February, type from St. Vincent, Lesser Antilles. Known only from St. Vincent, Lesser Antilles. (Not examined and group association not determined by Goldman, N. Amer. Fauna, 43:16, September 23, 1918).

External measurements of type are: length of head and body, 96; tail, 121; hind foot without claws, 25. The characters of this species are not completely known and its systematic position is consequently problematical. Seemingly, the general characters are essentially the same as in *O. tectus.*

Subgenus **Oligoryzomys** Bangs

1900. *Oligoryzomys* Bangs, Proc. New England Zool. Club, 1:94, February 23. Type, *Oryzomys navus* Bangs.

Size small; hind foot usually less than 25; form slender and *Reithrodontomys*-like; tail markedly longer than head and body; 4 longer toes of hind feet bearing tufts of silvery bristles projecting beyond ends of claws. Skull delicate, smoothly rounded; supraorbital and temporal ridges absent; least interorbital constriction about equal to width of rostrum between antorbital foramina; molars with re-entrant angles usually broader than in subgenus *Oryzomys,* the salient angles formed by worn crowns of tubercles less evenly rounded; upper molars early exhibiting small, circular central enamel islands that persist until obliterated by wear in extreme old age (after Goldman, 1918b:87–88).

Oryzomys fulvescens
Pygmy Rice Rat

External measurements: 168–235; 96–130; 20–25. Upper parts varying from ochraceous buff to tawny, most intense on rump, lightly mixed dorsally with blackish hairs; underparts white, sometimes strongly washed with buff; tail dark brown above, paler below, dusky above and below at tip.

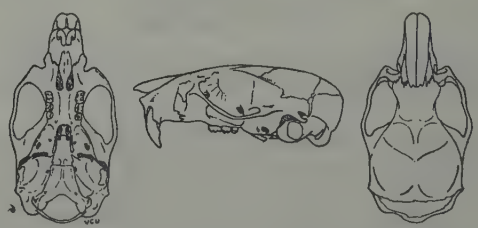


Fig. 318. *Oryzomys fulvescens fulvescens,* Cautlapan (= Ixtaczequitlan), 4000 ft., Veracruz, No. 30575 K.U., ♂, X 1½.

Oryzomys fulvescens costaricensis J. A. Allen

1893. *Oryzomys costaricensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:239, September 22, type from El General, 2150 ft., Puntarenas, Costa Rica.

1918. *Oryzomys fulvescens costaricensis,* Goldman, N. Amer. Fauna, 43:92, September 23.

MARGINAL RECORDS.—Costa Rica: Cerros de San Juan (Harris, 1943:12); San Gerónimo Pirrís (Goodwin,

Map 332. *Oryzomys fulvescens.*

Guide to subspecies			
1. *O. f. costaricensis*	2. *O. f. creper*	5. *O. f. lenis*	8. *O. f. pacificus*
	3. *O. f. engraciae*	6. *O. f. mayensis*	9. *O. f. reventazoni*
	4. *O. f. fulvescens*	7. *O. f. nicaraguae*	10. *O. f. vegetus*

1946:396); *Hda. Santa María* (Harris, 1943:12); Cartago (*ibid.*); Buenos Aires (Goodwin, 1946:396); *Boruca* (*ibid.*); Agua Buena (*ibid.*). Panamá: Barro Colorado Island (Enders, 1930:286); Old Panamá (Goldman, 1920:102), thence westward along Pacific Coast to point of beginning.

Oryzomys fulvescens creper Goodwin

1945. *Oryzomys fulvescens creper* Goodwin, Amer. Mus. Novit., 1293:2, July 20, type from Volcán Irazú, 9400 ft., Cartago, Costa Rica.

MARGINAL RECORDS (Goodwin, 1946:397).—Costa Rica: Cataratos San Carlos; Buena Vista; Cervantes; Escazú.

Oryzomys fulvescens engraciae Osgood

1945. *Oryzomys fulvescens engraciae* Osgood, Jour. Mamm., 26:300, November 14, type from Hacienda Santa Engracia, NW of C. Victoria, Tamaulipas.

MARGINAL RECORDS.—Nueva León: 20 km. NW General Terán, 900 ft. (Hooper, 1947:53). Tamaulipas: type locality; 70 km. by highway S of C. Victoria, 2 km. E El Carrizo (Baker, 1951:216).

Oryzomys fulvescens fulvescens (Saussure)

1860. *H[esperomys]. fulvescens* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:102, March, type from Veracruz; fixed by Merriam (Proc. Washington Acad. Sci., 3:295, July 26, 1901) at Orizaba.

1897. *Oryzomys fulvescens*, J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:204, June 16.

MARGINAL RECORDS.—Tamaulipas: Rancho del Cielo (Goodwin, 1954:10); Altamira (Dalquest, 1950:7), thence southward along Gulf Coast to Veracruz: 3 km. E San Andrés Tuxtla, 100 ft. (24130 KU). Honduras: Patuca (Goldman, 1918b:91); La Piedra de Jesús, Sabana Grande (Goodwin, 1942:165). Guatemala: Finca Cipres (Good-

win, 1934:48). Chiapas: Las Margaritas, 15 mi. E Comitán (Hooper, 1952b:24); Tumbalá (Goldman, 1918b:90–91). Oaxaca: Tuxtepec (*ibid.*). Veracruz: type locality; 4 km. W Tlapacoyan, 1700 ft. (24121 KU); 5 km. S Tehuatlán, 700 ft. (24119 KU). Hidalgo: 16 km. NW Jacala, 1550 m. (Baker and Villa, 1953:149). San Luis Potosí (Dalquest, 1953b: 127): Xilitla; El Salto.

Oryzomys fulvescens lenis Goldman

1915. *Oryzomys fulvescens lenis* Goldman, Proc. Biol. Soc. Washington, 28:130, June 29, type from Los Reyes, Michoacán.

MARGINAL RECORDS.—Nayarit: vicinity Santa Isabel (Hooper, 1952b:24). Michoacán: type locality. Guerrero: Chapa, 1470 m. (35369 KU). Chiapas: *central Chiapas* (Hooper, 1952b:24), thence northward along coast to point of beginning.

Oryzomys fulvescens mayensis Goldman

1918. *Oryzomys fulvescens mayensis* Goldman, N. Amer. Fauna, 43:92, September 23, type from Apazote, near Yohaltún, Campeche.

MARGINAL RECORDS.—Yucatán: Tunkas (Goldman, 1918b:92); Chichén-Itzá (*ibid.*). Campeche: type locality.

Oryzomys fulvescens nicaraguae J. A. Allen

1910. *Oryzomys* (*Oligoryzomys*) *nicaraguae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 28:100, April 30, type from Vijagua [= Bijagua], Boaco, Nicaragua.
1946. *Oryzomys fulvescens nicaraguae*, Goodwin, Bull. Amer. Mus. Nat. Hist., 87:397, December 31.

MARGINAL RECORDS.—Nicaragua: type locality; San Rafael del Norte (J. A. Allen, 1910:100).

Oryzomys fulvescens pacificus Hooper

1952. *Oryzomys fulvescens pacificus* Hooper, Proc. Biol. Soc. Washington, 65:23, January 29, type from Mapastepec, Chiapas.

MARGINAL RECORDS (Hooper, 1952b:25).—Chiapas: Arriaga, 300 ft. Guatemala: Hda. California.

Oryzomys fulvescens reventazoni Goodwin

1945. *Oryzomys fulvescens reventazoni* Goodwin, Amer. Mus. Novit., 1293:3, July 20, type from Santa Teresa Peralta, Cartago, Costa Rica. Known only from the type locality.

Oryzomys fulvescens vegetus Bangs

1902. *Oryzomys* (*Oligoryzomys*) *vegetus* Bangs, Bull. Mus. Comp. Zool., 39:35, April, type from Boquete, 4000 ft., Volcán de Chiriquí, Chiriquí, Panamá. Known only from the type locality.
1918. *Oryzomys fulvescens vegetus*, Goldman, N. Amer. Fauna, 43:93, September 23.

Subgenus **Melanomys** Thomas

1902. *Melanomys* Thomas, Ann. Mag. Nat. Hist., ser. 7, 10:248, September. Type, *Oryzomys phaeopus* Thomas.

Color dark; upper parts and underparts not strongly contrasted; form robust; tail approximately three-quarters length of head and body, black all around; hind feet broad, stout, digital bristles not projecting beyond ends of claws. Skull rotund; rostrum short, nearly straight; braincase large and inflated; frontals broad, their lateral margins projecting as supraorbital shelves; zygomata slender, but maxillary root decidedly expanded above along frontal and premaxillary sutures (after Goldman, 1918b:94–95).

Oryzomys caliginosus
Dusky Rice Rat

External measurements: 196–240; 85–105; 25–27.5. Upper parts varying from russet to tawny, finely but heavily mixed with black; underparts paler in most individuals, but neither sharply nor conspicuously so.

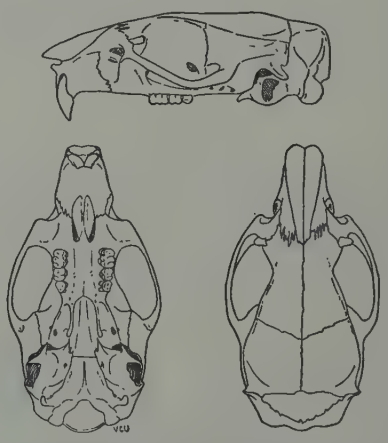


Fig. 319a. *Oryzomys caliginosus chrysomelas*, 5 km. SE Turrialba, 1950 ft., Prov. Cartago, Costa Rica, No. 27037 K.U., ♂, X 1½.

Oryzomys caliginosus chrysomelas J. A. Allen

1897. *Oryzomys chrysomelas* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:37, March 11, type from Suerre, near Jiménez, Limón, Costa Rica.
1918. *Oryzomys caliginosus chrysomelas*, Goldman, N. Amer. Fauna, 43:97, September 23.

MARGINAL RECORDS (Goldman, 1918b:98, unless otherwise noted).—Nicaragua: Río Coco; *Río Grande*. Costa Rica: Port Limón; Talamanca, probably near Sipurio (Goodwin, 1946:398). Panamá: Bogava [= Bugaba] (Goldman, 1920:104). Costa Rica: Coto (Harris, 1943:12); San Gerónimo Pirrís (Goodwin, 1946:398); Cataratos San Carlos (*ibid.*). Nicaragua: Peña Blanca; Tuma.

Map 333. Three species of *Oryzomys*.

1. *O. caliginosus chrysomelas*
2. *O. caliginosus idoneus*
3. *O. endersi*
4. *O. trabeatus*

Oryzomys caliginosus idoneus Goldman

1912. *Oryzomys idoneus* Goldman, Smiths. Miscl. Coll., 56(36):5, February 19, type from Cerro Azul, 2500 ft., near headwaters of Chagres River, Panamá.
1918. *Oryzomys caliginosus idoneus* Goldman, N. Amer. Fauna, 43:96, September 23.

MARGINAL RECORDS.—Panamá (Goldman, 1920: 104): Gatún; type locality; Tacarcuna; Cana; Maxon Ranch, Río Trinidad.

Subgenus **Oecomys** Thomas

1906. *Oecomys* Thomas, Ann. Mag. Nat. Hist., ser. 7, 18: 444, December. Type, *Rhipidomys benevolens* Thomas.

Rostrum short; braincase broad; interorbital constriction faintly marked; supraorbital ridges evenly divergent posteriorly; bullae relatively small; zygomatic plate normally straight anteriorly; palate and dentition as in subgenus *Oryzomys*; feet broad and modified for arboreal life; 5th digit of hind foot long; tail long, moderately haired, faintly tufted terminally (after Ellerman, 1941:342).

This subgenus is accorded generic rank by most authors. Ellerman (1941:340–342) arranges it as a subgenus of *Oryzomys* and expresses a doubt that it should be retained even at that level.

KEY TO NORTH AMERICAN SPECIES OF SUBGENUS OECOMYS

1. Hind foot less than 23; occurring in central Panamá. . . . . *O. trabeatus*, p. 569
1′. Hind foot more than 23; occurring in extreme eastern Panamá. . . . *O. endersi*, p. 569

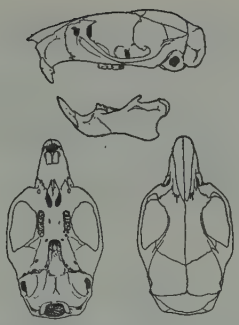


Fig. 319b. *Oryzomys endersi*, Barro Colorado Island, Canal Zone, Panamá, holotype, X 1.

Oryzomys endersi (Goldman)
Enders' Rice Rat

1933. *Oecomys endersi* Goldman, Jour. Washington Acad. Sci., 23:525, November 15, type from Barro Colorado Island, Canal Zone, Panamá. Known only from the type locality.
1941. *Oryzomys endersi*, Hayman and Holt, *in* Ellerman, The families and genera of living rodents, British Mus., 2:358, March 21.

External measurements of the type are: 238; 124; 25. Upper parts approximately cinnamon brown, heavily infused with black; underparts white; tail dark brown above, paler below.

This species is represented in collections only by the type and adequate characterization must await additional material.

Oryzomys trabeatus (G. M. Allen and Barbour)
Regal Rice Rat

1923. *Oecomys trabeatus* G. M. Allen and Barbour, Bull. Mus. Comp. Zool., 65:262, February, type from Río Jesucito, Panamá.

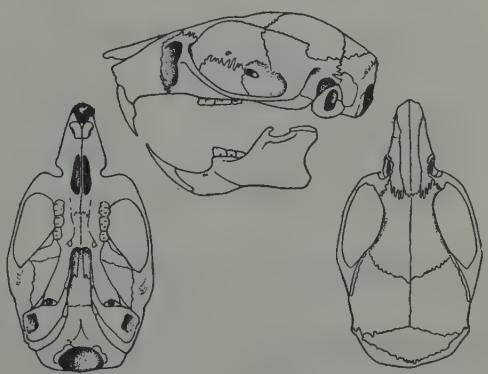


Fig. 319c. *Oryzomys trabeatus*, Río Jesucito, Panamá, holotype, X 1½.

1941. *Oryzomys trabeatus,* Hayman and Holt, *in* Ellerman, The families and genera of living rodents, British Mus., 2:359, March 21.

External measurements of the type are: 230; 120; 22. Upper parts bright ochraceous rufous darkened, especially middorsally, with black; underparts white; tail unicolored, brown.

This species, like *O. endersi,* is known from a single specimen.

Genus Megalomys Trouessart

1881. *Megalomys* Trouessart, Le Naturaliste, 1:357, February 1. Type, *Mus pilorides* Desmarest, 1826 (not *Mus pilorides* Pallas, 1779, an undeterminable form).
1903. *Moschomys* Trouessart, Ann. Mag. Nat. Hist., ser. 7, 11:388, April. Mistakenly substituted for *Megalomys* Trouessart, 1881, because of the existence of *Megamys* Laurillard, 1848. Not *Moschomys* Billberg, 1828, of which the type is *Castor zibethicus* Linnaeus, 1766.
1904. *Moschophoromys* Elliot, Field Columb. Mus., Publ. 90, Zool. Ser., 3:270, March 7, a renaming of *Moschomys* Trouessart, 1903.

Braincase extremely narrow; interorbital region little constricted; occipital region excessively developed, elevated; supraorbital region with extremely well-developed ridges extending posteriorly onto supraoccipital region; zygomatic plate only slightly cut back above; anterior palatine foramina short, terminating posteriorly well anterior to level of beginning of cheek-teeth; tympanic bullae much reduced; molariform dentition as in *Oryzomys.*

Only a few complete specimens of this genus are in existence and it is likely that it has been extirpated. Its original distribution can only be guessed.

Forsyth Major (1901:205) considered *Megalomys* to be inseparable generically from *Oryzomys.*

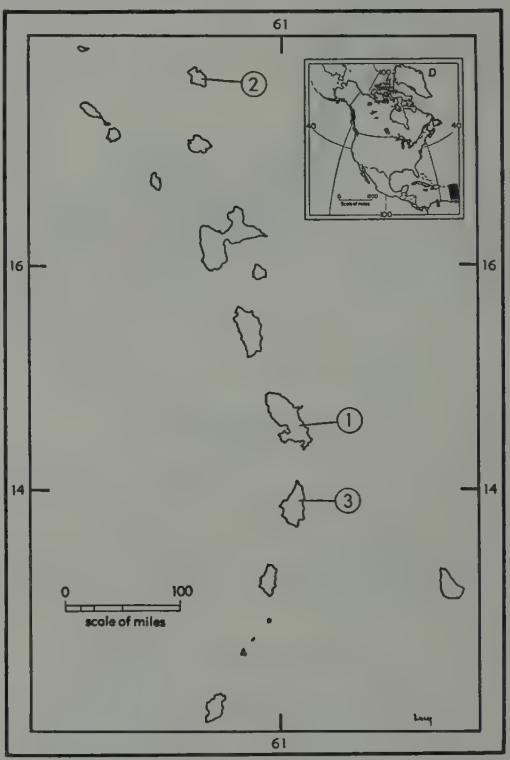
Key to Species of Megalomys

1. Diastema in lower jaw less than 9. *M. audreyae,* p. 570
1′. Diastema in lower jaw more than 9.
2. Maximum breadth of braincase across squamosals less than 18. . *M. luciae,* p. 571
2′. Maximum breadth of braincase across squamosals more than 18. *M. desmarestii,* p. 570

Megalomys desmarestii (Fischer)
Antillean Muskrat

1829. *M[us]. Desmarestii* Fischer, Synopsis mammalium, p. 316, type from Martinique, Lesser Antilles. Known only from the type locality.
1902. *Megalomys desmarestii,* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:21, February 1.
1826. *Mus pilorides* Desmarest, Encyclopédie méthodique . . . , p. 483. Not *Mus pilorides* Pallas, 1779, unidentifiable.

Fischer (1829:316) describes this animal as having a glossy black color, with chin, throat, and base of tail pure white.



Map 334. *Megalomys.*

Guide to species
1. *M. desmarestii*
2. *M. audreyae*
3. *M. luciae*

Megalomys audreyae Hopwood
Audrey's Muskrat

1926. *Megalomys audreyae* Hopwood, Ann. Mag. Nat. Hist., ser. 9, 17:329, March, type from a cave on island of Barbuda, Lesser Antilles. Known only from the type locality.
1904. [*Megalomys*] *majori* Trouessart, Catalogus mammalium . . . , Suppl., fasc. 2, p. 415, a *nomen nudum.*

This species is known by a portion of a mandibular ramus and an upper incisor. It was described as having been obtained from Pleistocene breccia. Since the age of the material is possibly Recent, the species is listed here.

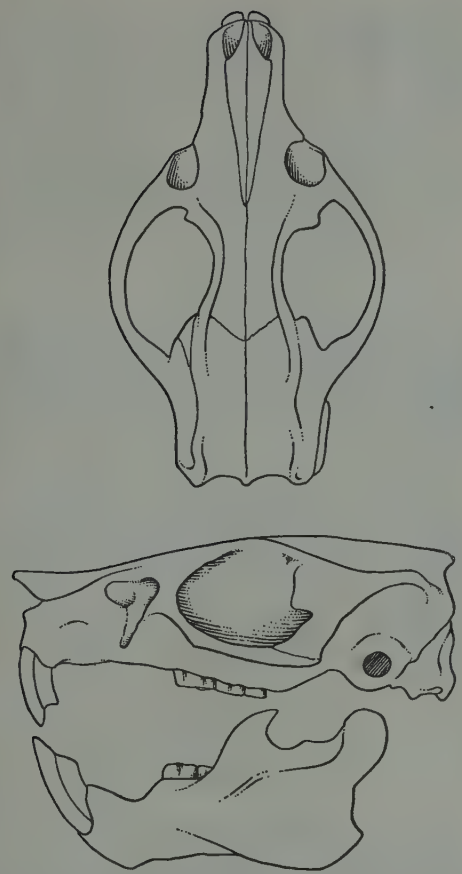


Fig. 320. *Megalomys* [*desmarestii*?], from Trouessart, Ann. des Scienc. Nat., Zool. 19 (art. 5), sur le Rat Musqué des Antilles, type du sous-genre Megalomys et sur la place de ce sous-genre dans le groupe des rats Americanis. Pl. 1. X 1.

Megalomys luciae (Forsyth Major)
Santa Lucia Muskrat

1901. *Oryzomys luciae* Forsyth Major, Ann. Mag. Nat. Hist., ser. 7, 7:206, February, type from Santa Lucia, Lesser Antilles. Known only from Santa Lucia.
1905. [*Megalomys*] *luciae*, Trouessart, Catalogus mammalium . . . , Suppl., p. 415.

Basal length of skull, 41 (shorter than in *M. desmarestii*); greatest breadth of skull, 27.0; length of upper series of molars, 7.5. Anterior margin of infraorbital foramen more convex anteriorly than in *M. desmarestii*; underparts nearly wholly brown and continuous with color of upper parts (underparts white in *M. desmarestii*).

Genus Neacomys Thomas—Bristly Mice

1900. *Neacomys* Thomas, Ann. Mag. Nat. Hist., ser. 7, 5: 153, January. Type, *Hesperomys spinosus* Thomas, 1882.

Skull small but with well developed supraorbital ridges; zygomatic plate nearly straight anteriorly; palate with well-marked lateral pits; anterior palatine foramina terminating anterior to tooth-rows; tympanic bullae small; interparietal well developed. Tail approximately equal in length to head and body; digits 1 and 5 of hind foot much shorter than 2, 3, and 4. The most conspicuous difference between this genus and *Oryzomys* is the presence of spines or bristles on the back of *Neacomys*.

Only one species occurs north of South America.

Neacomys pictus Goldman
Painted Bristly Mouse

1912. *Neacomys pictus* Goldman, Smiths. Miscl. Coll., 60(2):6, September 20, type from Cana, 1800 ft., eastern Panamá.

Average external measurements of 3 adult topotypes are: 158–163; 83–87; 20.5–21. Upper parts orange rufous mixed with black, imparting a grizzled effect, the black predominant middorsally; sides, clearer, near ochraceous-buff, sharply demarked from underparts; underparts white; tail dark brown above, paler below except for dusky tip. Skull oryzomyine in general aspect; braincase bulging posteriorly well behind plane of occipital condyles; temporal ridges extending along lateral margins of parietals to supraoccipital; nasals terminating posteriorly behind premaxillary tongues.

MARGINAL RECORDS.—Panamá: Tacarcuna (Goldman, 1920:96); type locality.

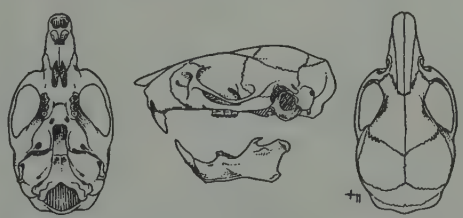


Fig. 321. *Neacomys pictus*, Cana, Panamá, No. 178715 U.S.N.M., ♂, X 1½.

Genus Nectomys Peters—Water Rats

Revised by Hershkovitz, Miscl. Publ. Mus. Zool., Univ. Michigan, 58:1–88, January 4, 1944.

1861. *Nectomys* Peters, Abh. preuss. Akad. Wiss., Berlin, for 1860, p. 151. Type, *Mus squamipes* Lichtenstein.
1897. *Sigmodontomys* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:38, March 11. Type, *Sigmodontomys alfari* J. A. Allen. Valid as a subgenus.

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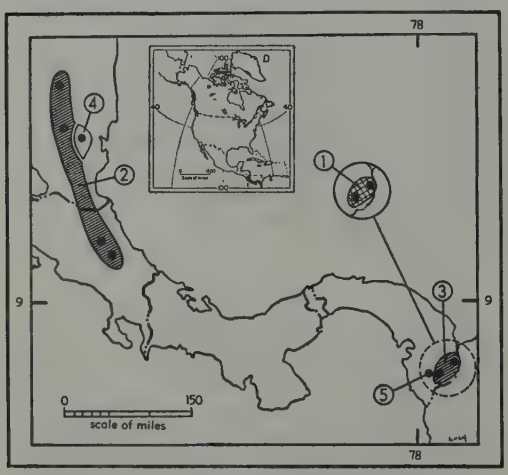
Length of head and body, 115–254; tail, 115–251; hind foot, 28–58. Pelage moderate to long; upper parts buffy to tawny with brown admixtures; sides paler; underparts never sharply defined, whitish to grayish with a light to pronounced wash of ochraceous; hind foot large and broad. Skull large, robust, flattened; rostrum robust; braincase relatively reduced; supraorbital ridges well developed and beaded; width of interparietal subequal to or usually less than width across ridges at frontoparietal sutures; zygomatic plate wide, inclined anteriorly, approximately a third to half of width visible from above; tympanic bullae heavy, slightly inflated; upper cheek-teeth tend to become flat-crowned with outer folds isolated on crown surface.

Hershkovitz (1944:20) points out that none of the characters of *Nectomys* are unique, but the genus represents a unique combination of oryzomyine features.

KEY TO NORTH AMERICAN SPECIES OF NECTOMYS

1. Hind foot less than 30; length upper tooth-row less than 5. . . . . *N. dimidiatus*, p. 572
1'. Hind foot more than 30; length upper tooth-row more than 5. . . . . *N. alfari*, p. 572



Map 335. *Neacomys, Nectomys* and *Rhipidomys.*

Guide to kinds
1. *Neacomys pictus*
2. *Nectomys alfari alfari*
3. *Nectomys alfari efficax*
4. *Nectomys dimidiatus*
5. *Rhipidomys scandens*

Subgenus Sigmodontomys J. A. Allen

1897. *Sigmodontomys* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:38, March 11. Type, *Sigmodontomys alfari* J. A. Allen.

Length of head and body, 115–152; tail, 149–190; hind foot, 33.8–40. Certain characters by which this subgenus differs from the subgenus *Nectomys* are: smaller average size; pelage characterized mainly by long, dense covering of wool hairs (not by glossy guard hairs); tail lacking ventral keel of stiff hairs, median part of alveolar part of maxilla behind M3 projecting as a ledge over posterolateral palatine fossa; sphenopalatine vacuities present.

Nectomys alfari
Alfaro's Water Rat

Upper parts ochraceous-orange to ochraceous-buff mixed with brown; underparts gray to white with buffy wash; tail uniformly grayish brown or slightly paler below. Other characters as for the subgenus.

Fig. 322a. *Nectomys alfari efficax*, Cana, Panamá, No. 178629 U.S.N.M., ♂, X 1.

Nectomys alfari alfari (J. A. Allen)

1897. *Sigmodontomys alfari* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:39, March 11, type from Jiménez, 700 ft., Limón, Costa Rica.
1913. *Nectomys alfari alfari*, Goldman, Smiths. Miscl. Coll., 60(22):7, February 28.
1908. *Oryzomys ochraceus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:655, October 13, type from Río Grande, Zelaya, Nicaragua.

MARGINAL RECORDS.—Nicaragua (Hershkovitz, 1944: 101): Río Grande and Río Tuma; Río Siquía. Costa Rica: type locality; Santa Teresa Peralta (Goodwin, 1946:402).

Nectomys alfari efficax Goldman

1913. *Nectomys alfari efficax* Goldman, Smiths. Miscl. Coll., 60(22):7, February 28, type from Cana, 1800 ft., eastern Panamá.

MARGINAL RECORDS.—Panamá: Tacarcuna (Hershkovitz, 1944:101); type locality.

Nectomys dimidiatus Thomas
Thomas' Water Rat

1905. *Nectomys dimidiatus* Thomas, Ann. Mag. Nat. Hist., ser. 7, 15:586, June, type from Río Escondido, 7 mi. below Rama, Nicaragua. Known only from the type locality.

In the type: head and body, 125; tail, 115; hind foot, 28. Dorsum brownish; venter clay color; tail slaty gray above, whitish below. See Hershkovitz (1948:55) who makes *N. dimidiatus* the type of the new subgenus, *Micronectomys*, of the genus *Oryzomys*.

Genus **Rhipidomys** Tschudi—Climbing Mice

1844. *Rhipidomys* Tschudi, Archiv Naturgesch., Jahrg. 10, 1:252. Type, *Hesperomys leucodactylus* Tschudi.

Feet broad, adapted for arboreal life; hallux long, clawed; tail longer than head and body, well haired, tufted. Skull having supraorbital ridges; interparietal markedly enlarged; zygomatic plate relatively narrow, straight anteriorly; anterior palatine foramina broadly opened, extending to tooth-rows; palate short, not reaching posterior level of tooth-rows; tympanic bullae small.

This genus is represented north of South America only by the holotype, and only known specimen, of *R. scandens*. More than 30 species are currently standing in the literature and it is evident that these are in need of a re-evaluation.

Rhipidomys scandens Goldman
Mt. Pirri Climbing Mouse

1913. *Rhipidomys scandens* Goldman, Smiths. Miscl. Coll., 60(22):8, February 28, type from near head of Río Limón, Mount Pirri, 5000 ft., eastern Panamá. Known only from the type locality.

External measurements: 330; 198; 32. Upper parts pale cinnamon-rufous lined with black; underparts white to base of hairs; tail brownish above and below. Braincase somewhat broader than in allied species.

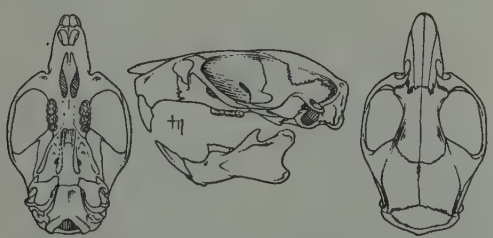


Fig. 322b. *Rhipidomys* [species *cearanus*, Sitio Grangeiro, Crato Ceava, Brazil], No. 27308 K.U., ♀, X 1.

Genus **Tylomys** Peters—Climbing Rats

1866. *Tylomys* Peters, Monatsb. preuss. Akad. Wiss., Berlin, p. 404. Type, *Hesperomys* (*Tylomys*) *nudicaudus* Peters.

Superficially resembling large specimens of *Rattus rattus*; ears large, naked; tail long, almost bare. Skull elongated; braincase flattened; supraorbital ridges highly developed; anterior palatine foramina broad; occipital region low, prominently ridged; M1 evenly rectangular; subsidiary ridges in main outer folds of upper cheek-teeth not extending to outer border of crown. Ranges into South America.

Key to Nominal North American Species of Tylomys

1. Occurring in Costa Rica or Panamá.
   2. Underparts fulvous. . . *T. fulviventer*, p. 573
   2′. Underparts white.
      3. Proximal part of tail brown. *T. watsoni*, p. 575
      3′. Proximal part of tail glossy black. *T. panamensis*, p. 575
1′. Occurring north of Costa Rica.
   4. Tympanic bullae large and globose anteriorly, lacking marked anterior projection. . . . . *T. bularis*, p. 573
   4′. Tympanic bullae not markedly inflated, having conspicuous anterior projection.
      5. Blackish middorsal stripe absent. *T. gymnurus*, p. 574
      5′. Blackish middorsal stripe present.
         6. Maxillary tooth-row more than 9.1. . . . . *T. tumbalensis*, p. 575
         6′. Maxillary tooth-row less than 9.1. *T. nudicaudus*, p. 575

Tylomys bullaris Merriam
Chiapan Climbing Rat

1901. *Tylomys bullaris* Merriam, Proc. Washington Acad. Sci., 3:561, November 29, type from Tuxtla, Chiapas. Known only from the type locality.

External measurements of the immature type, the only known specimen, are: 324; 158; 37.5. Upper parts pale grayish plumbeous; upper lip and patch on side of nose white; underparts white; feet brown to toes which are white. Interparietal broad; zygomata widely spreading; auditory bullae markedly inflated, globose rather than pointed anteriorly.

Tylomys fulviventer Anthony
Fulvous-bellied Climbing Rat

1916. *Tylomys fulviventer* Anthony, Bull. Amer. Mus. Nat. Hist., 35:366, June 9, type from Tacarcuna, 4200 ft., Darién, Panamá. Known only from the type locality.

External measurements of the type, the only known specimen, are: 451; 233; 38. Upper parts dark brown, darkest medially; sides paler; under-

Map 336. Nominal species of *Tylomys*.

Guide to kinds
1. *T. bullaris*
2. *T. fulviventer*
3. *T. gymnurus*
4. *T. nudicaudus nudicaudus*
5. *T. nudicaudus microdon*
6. *T. panamensis*
7. *T. tumbalensis*
8. *T. watsoni*

parts with russet median line extending from pectoral region to base of tail, ochraceous buff on either side of median stripe; tail black above basally, below gray, distally flesh colored; toes dusky. Anterior palatine foramina long, posteriorly attaining level of first molars; nasals exceeding premaxillae posteriorly.

Tylomys gymnurus Villa
Naked-tailed Climbing Rat

1941. *Tylomis* [*sic*] *gymnurus* Villa, Anal. Inst. Biol. Univ. Nac. México, 12:763, November 18, type from Presidio, Veracruz.

External measurements of an adult female and male from 3 km. E San Andrés Tuxtla, Veracruz, are, respectively: 472, 488; 228, 235; 39, 44. An adult female (18167 K.U.) from 8 km. NW Potrero, Veracruz, measures 482, 257, 40. Upper parts red-brown fading to paler (clearer) on the sides; underparts white, hairs bluish or plumbeous basally; feet approximately russet, tips of toes white; tail nearly hairless, dark for basal two-thirds, yellowish white distally. Skull described (Villa, 1941:764) as differing from those of other known species chiefly in shortness of nasals (16.1 and 16.2 in above mentioned specimens from 3 km. E San Andrés Tuxtla).

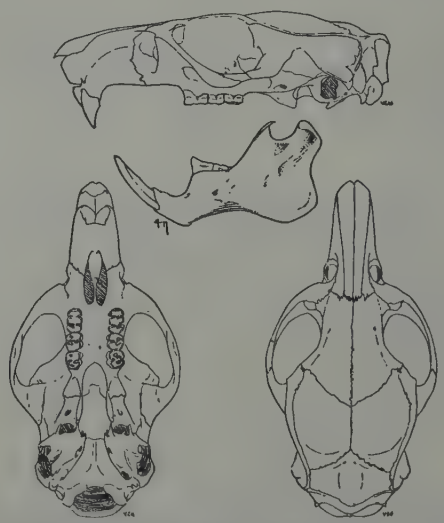


Fig. 323. *Tylomys gymnurus*, Río Atoyac, 8 km. NW Potrero, Veracruz, No. 18167 K.U., ♀, X 1.

MARGINAL RECORDS.—Veracruz: 8 km. NW Potrero (18167 KU); 3 km. E San Andrés Tuxtla (24135 KU); 25 km. SE Jésus Carranza (32167 KU). Oaxaca: Ixcuintepec (Goodwin, 1955c:4). Veracruz: 3 mi. N Presidio (19725 KU).

Tylomys nudicaudus Peters' Climbing Rat

External measurements of an adult male from La Gloria, Oaxaca, and an adult female from La Primavera, Guatemala, are: 422, 500; 227, 400; 39, 45. Upper parts wood brown to dark grayish brown, darkest on crown and middorsal area; underparts white or pale buffy fulvous with white patch inguinally and on axillary areas; legs and feet brown (toes white in some specimens); nasals wedge-shaped, terminating posteriorly on a line with tongues of premaxillae.

Tylomys nudicaudus nudicaudus (Peters)

1866. *Hesperomys* (*Tylomys*) *nudicaudus* Peters, Monatsb. preuss. Akad. Wiss., Berlin, p. 404, pl. 1, figs. 1–4, type from Guatemala; La Primavera, 3200 ft., about 10 mi. SW Cobán, Alta Verapaz, regarded as probable type locality by Goodwin, Bull. Amer. Mus. Nat. Hist., 68:48, December 12, 1934.

1897. [*Tylomys*] *nudicaudus*, Trouessart, Catalogus mammalium . . . , fasc. 3, p. 520.

MARGINAL RECORDS.—Chiapas: Palenque (Kuns and Tashian, 1954:102). British Honduras: Silkgrass (Laurie, 1953:383). Nicaragua: Río Coco (J. A. Allen, 1910:100). Guatemala: La Primavera (Goodwin, 1934:49). Chiapas: Tuxtla Gutiérrez (Kuns and Tashian, 1954:102).

Tylomys nudicaudus microdon Goodwin

1955. *Tylomys nudicaudus microdon* Goodwin, Amer. Mus. Novit., 1738:1, June 10, type from La Gloria, rain forest at approximately 2500 ft., 10 km. SE Santa María Chimalapa, Isthmus of Tehuantepec, Oaxaca. Known only from the type locality.

Tylomys panamensis (Gray) Panamá Climbing Rat

1873. *Neomys panamensis* Gray, Ann. Mag. Nat. Hist., ser. 4, 12:417, November, type from Panamá, referred specimens from Cana, Panamá (Goldman, 1920:92).

1897. [*Tylomys*] *panamensis*, Trouessart, Catalogus mammalium . . . , fasc. 3, p. 520.

"Mouse-coloured; back blackish-washed, with longer hairs; sides of head and body rather paler; throat, chest, underside of body, and inside of legs white; feet brownish with white hairs over the claws; tail slender, naked, glossy black, white at the end. Size of a common rat (*Mus decumanus* [= *Rattus norvegicus*])" (Gray, 1873:417).

Tylomys tumbalensis Merriam Tumbalá Climbing Rat

1901. *Tylomys tumbalensis* Merriam, Proc. Washington Acad. Sci., 3:560, November 29, type from Tumbalá, Chiapas. Known only from the type locality.

External measurements of the type, a young adult, are: 448; 234; 46. Upper parts dark gray to markedly blackish medially; sides brownish; chin, chest, part of inguinal region white; venter plumbeous washed with buff; toes dark brown; proximal half of tail blackish, distal part yellow. Skull large, long, flattened. According to Merriam (1901:560–561), in comparison with the skull of *T. nudicaudus*, that of *T. tumbalensis* is: "less massive and more slender; rostrum and nasals decidedly more slender . . . ; bullae slightly larger; upper incisors weaker and more slender; molar series very large and heavy . . . (measuring 9.5 mm.)."

Tylomys watsoni Thomas Watson's Climbing Rat

1899. *Tylomys watsoni* Thomas, Ann. Mag. Nat. Hist., ser. 7, 4:278, October, type from Bogava [= Bugaba], 800 ft., Volcán de Chiriquí, Chiriquí, Panamá.

External measurements of an adult male and the type are, respectively: 475, 493; 250, 243; 35, 38. Upper parts cinnamon buff with pronounced admixture of brown; underparts whitish; feet brown with white toes; tail mummy brown for basal two-thirds, whitish distally. Skull elongated; braincase flattened, depressed in interorbital region; premaxillae extending posteriorly slightly beyond nasals.

MARGINAL RECORDS.—Panamá: Cerro Brujo (Goldman, 1920:91); type locality. Costa Rica (Goodwin, 1946: 400): Palmar; *San Joaquin de Dota*; La Carpintera; Río Sixaola.

Genus Ototylomys Merriam—Big-eared Climbing Rats

1901. *Ototylomys* Merriam, Proc. Washington Acad. Sci., 3:561, November 29. Type, *Ototylomys phyllotis* Merriam.

Closely resembles *Tylomys* in majority of features, but smaller; skull flattened, interparietal large; supraorbital ridges well developed and forming a shelf over orbit; tympanic bullae much enlarged and inflated; coronoid process much reduced; pattern of molars diverging from basic oryzomyine pattern; cusps more nearly symmetrical than usual, folds in crown opposite one another,

deep, and nearly meeting in middle of tooth; subsidiary ridges in main folds of upper molars much reduced.

KEY TO SPECIES OF OTOTYLOMYS

1. Condylobasal length less than 35; palatal slits less than 7.0. . . . *O. brevirostris*, p. 577
1′. Condylobasal length more than 35; palatal slits more than 7.0.
2. Hairs of venter white basally. *O. phyllotis*, p. 576
2′. Hairs of venter slate gray basally. *O. connectens*, p. 576

Ototylomys connectens Sanborn
Sanborn's Climbing Rat

1935. *Ototylomys connectens* Sanborn, Field Mus. Nat. Hist., Zool. Ser., 20(11):82, May 15, type from Cobán, Alta Verapaz, Guatemala.

External measurements of the type (an adult male) and a female topotype are, respectively: 355, 370; 171, 191; 33, 32. Upper parts dark gray intermixed with black- and brown-tipped hairs; undersides of forearms, chin, upper lip, a band across chest, and some hairs at base of tail white to root; other hairs of venter white-tipped, plumbeous basally; feet brown above with white digits; tail gray-brown above, slightly paler below. Skull essentially like that of *O. phyllotis*, but teeth larger and anterior palatine foramina more rounded posteriorly.

The geographic range of this species overlaps to some extent that of *O. phyllotis guatemalae*. Where the two occur in the same region, *O. connectens* is found in the lower humid forests of the valleys and *O. p. guatemalae* is restricted to the highlands.

This species shows certain characters that tend toward *Tylomys*—more so than does *O. phyllotis*.

MARGINAL RECORDS (Sanborn, 1935:83).—Guatemala: Chimoxán; type locality; Finca Chamá. See Map 338.

Ototylomys phyllotis
Big-eared Climbing Rat

External measurements: 242–360; 119–171; 21–30. Upper parts varying from gray-brown to rich, dull, dark brown, sometimes intermingled with black hairs; sides paler, clearer; underparts white; tail brownish above, yellowish below, almost hairless. Skull long; rostrum slender; nasals long, slender, with sides nearly parallel; zygomata widest spread posteriorly; interparietal approximately strap-shaped, but narrower laterally than medially.

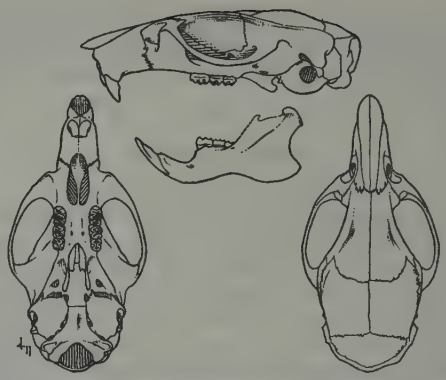


Fig. 324. *Ototylomys phyllotis australis*, Monte Rey, 22 km. S San José, Prov. San José, Costa Rica, No. 39255 K.U., ♀, X 1.

Ototylomys phyllotis australis Osgood

1931. *Ototylomys phyllotis australis* Osgood, Field Mus. Nat. Hist., Publ. 295, Zool. Ser., 18:145, August 3, type from San Gerónimo, near Pozo Azul de Pirrís, Costa Rica.

MARGINAL RECORDS.—Costa Rica: Monte Rey, 22 km. S San José (39255 KU); type locality.

Ototylomys phyllotis fumeus J. A. Allen

1908. *Ototylomys fumeus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:658, October 13, type from Matagalpa, Matagalpa, Nicaragua.
1942. *Ototylomys phyllotis fumeus*, Goodwin, Bull. Amer. Mus. Nat. Hist., 79:166, May 29.

MARGINAL RECORDS.—Honduras (Goodwin, 1942: 167): La Flor Archaga. Nicaragua (J. A. Allen, 1910:100): Ocotal; Uluce; Peña Blanca. Costa Rica: Cerros de San Juan (Goodwin, 1946:401), thence northward along coast to Nicaragua: Volcán de Chinandega (J. A. Allen, 1910: 100). Honduras: Sabana Grande (Goodwin, 1942:167).

Ototylomys phyllotis guatemalae Thomas

1909. *Ototylomys guatemalae* Thomas, Abstr. Proc. Zool. Soc. London, p. 32, June 22, type from Tucuru, Río Polochic, about 50 mi. E Cobán, Guatemala.
1942. *Ototylomys phyllotis guatemalae*, Goodwin, Bull. Amer. Mus. Nat. Hist., 79:166, May 29.

MARGINAL RECORDS.—Yucatán: Chichén-Itzá (Laurie, 1953:383). British Honduras: Silkgrass (*ibid.*). Honduras (Goodwin, 1942:166): Catacamas; Santa Barbara. Guatemala: Chamá (Goodwin, 1934:49). Chiapas: about 6 mi. SE Palenque (Kuns and Tashian, 1954:102).

Ototylomys phyllotis phaeus Merriam

1901. *Ototylomys phyllotis phæus* Merriam, Proc. Washington Acad. Sci., 3:563, November 29, type from Apazote, near Yohaltún, Campeche. Known only from the type locality.

Map 337. *Ototylomys phyllotis.*

Guide to subspecies
1. *O. p. australis*
2. *O. p. fumeus*
3. *O. p. guatemalae*
4. *O. p. phaeus*
5. *O. p. phyllotis*

Ototylomys phyllotis phyllotis Merriam

1901. *Ototylomys phyllotis* Merriam, Proc. Washington Acad. Sci., 3:562, November 29, type from Tunkás, Yucatán.

MARGINAL RECORDS.—Yucatán: type locality. Quintana Roo: Esmeralda (Hatt and Villa, 1950:236). Yucatán: Calcehtok (*ibid.*).

Ototylomys brevirostris
Laurie's Climbing Rat

External measurements: head and body, 95–142; 100–146; 22–25. Upper parts grayish fulvous brown; underparts and feet white; tail brown above, blotched with yellowish below. Rostrum shorter and narrower than in *O. phyllotis* and palatine foramina markedly shorter.

Ototylomys brevirostris affinis Laurie

1953. *Ototylomys brevirostris affinis* Laurie, Ann. Mag. Nat. Hist., ser. 12, 6:390, May, type from Chichén-Itzá, Yucatán. Known only from the type locality.

Ototylomys brevirostris brevirostris Laurie

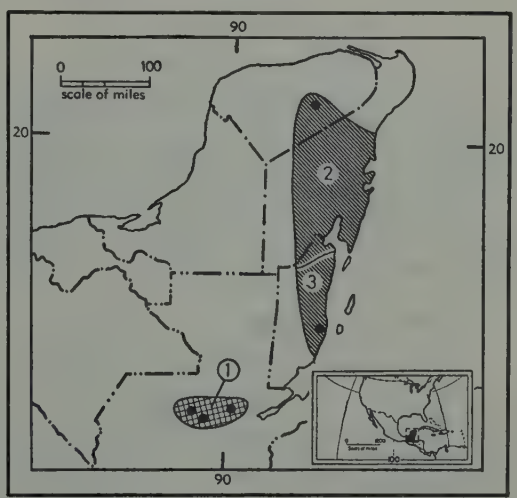
1953. *Ototylomys brevirostris brevirostris* Laurie, Ann. Mag. Nat. Hist., ser. 12, 6:389, May, type from Kates Lagoon, 17° 57′ N, 88° 30′ W, British Honduras. Known only from the type locality.

Genus Nyctomys Saussure—Sumichrast's Vesper Rat

1860. *Nyctomys* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:106, March. Type, *Hesperomys sumichrasti* Saussure.

Braincase and frontals broad; supraorbital ridges well developed and extending across parietals to occiput; interparietal broad and large, completely separating parietals from supraoccipital; rostrum short; zygomatic plate narrow, straight anteriorly; infraorbital foramen prominent; tympanic bullae small; palate broad, ending in front of posterior part of tooth-row, and without lateral pits; cheek-teeth resembling those of *Oryzomys* but extremely complex; hind foot considerably modified for arboreal life; tail well haired and tufted terminally; hallux clawed (after Ellerman, 1941:375). The genus is monotypic.

The vesper rat is brightly colored, arboreal, builds outside nests of twigs and fibers much like those of the red squirrel, and only occasionally descends to the ground.



Map 338. Two species of *Ototylomys.*

Guide to kinds
1. *O. connectens*
2. *O. brevirostris affinis*
3. *O. brevirostris brevirostris*

Map 339. *Nyctomys* and *Otonyctomys*.

Guide to kinds
1. *N. sumichrasti colimensis*
2. *N. sumichrasti costaricensis*
3. *N. sumichrasti decolorus*
4. *N. sumichrasti florencei*
5. *N. sumichrasti nitellinus*
6. *N. sumichrasti pallidulus*
7. *N. sumichrasti salvini*
8. *N. sumichrasti sumichrasti*
9. *N. sumichrasti venustulus*
10. *Otonyctomys hatti*

Nyctomys sumichrasti
Sumichrast's Vesper Rat

External measurements: 208–286; 85–156; 23–26. Upper parts buffy, cinnamon, or tawny with thin admixture of dark hairs, especially middorsally; sides clearer, usually paler; underparts white or almost so; feet usually white or almost so, but in some subspecies hind feet dusky to brownish; tail almost or quite unicolor, usually brown. Additional characters as for the genus.

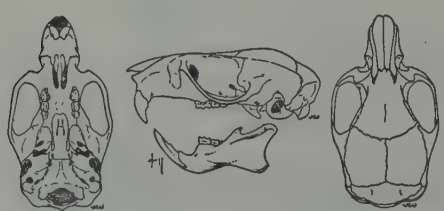


Fig. 325. *Nyctomys sumichrasti sumichrasti*, 20 km. E Jesús Carranza, 300 ft., Veracruz, No. 24137 K.U., ♀, X 1.

Nyctomys sumichrasti colimensis Laurie

1953. *Nyctomys sumichrasti colimensis* Laurie, Ann. Mag. Nat. Hist., ser. 12, 6:390, May, type from Juárez, Colima. Known only from the type locality.

Nyctomys sumichrasti costaricensis Goldman

1937. *Nyctomys sumichrasti costaricensis* Goldman, Jour. Washington Acad. Sci., 27:422, October 15, type from San Gerónimo de Pirrís, 100 ft., Puntarenas, Costa Rica.

MARGINAL RECORDS.—Costa Rica: type locality; Palmar (Goodwin, 1946:404).

Nyctomys sumichrasti decolorus (True)

1894. *Sitomys* (*Rhipidomys*) *decolorus* True, Proc. U. S. Nat. Mus., 16:689, February 5, type from Río de las Piedras, Honduras.
1916. *N*[*yctomys*]. *s*[*umichrasti*]. *decolorus*, Goldman, Proc. Biol. Soc. Washington, 29:155, September 6.

MARGINAL RECORDS (Goodwin, 1942:168, unless otherwise noted).—Honduras: Catacombas; Yaruca, 1000 ft. (Bangs, 1903:158); Catacamas; Cantoral; Las Flores.

Nyctomys sumichrasti florencei Goldman

1937. *Nyctomys sumichrasti florencei* Goldman, Jour. Washington Acad. Sci., 27:421, October 15, type from Barra de Santiago, Ahuachapán, El Salvador.

MARGINAL RECORDS (Goldman, 1937:422, unless otherwise noted.)—El Salvador: type locality; Volcán de San Miguel, 2600 ft. Nicaragua: Ocotal (on geographic grounds; referred by J. A. Allen (1910:100) to *Rhipidomys salvini* (Tomes)); thence along southern coast to point of beginning.

Nyctomys sumichrasti nitellinus Bangs

1902. *Nyctomys nitellinus* Bangs, Bull. Mus. Comp. Zool., 39:30, April, type from Boquete, 4000 ft., Chiriquí, Panamá.
1916. *N[yctomys]. s[umichrasti]. nitellinus*, Goldman, Proc. Biol. Soc. Washington, 29:155, September 6.

MARGINAL RECORDS (Goodwin, 1946:405).—Costa Rica: La Carpintera. Panamá: type locality. Costa Rica: Cau[h]ita.

Nyctomys sumichrasti pallidulus Goldman

1937. *Nyctomys sumichrasti pallidulus* Goldman, Jour. Washington Acad. Sci., 27:420, October 15, type from Santo Domingo, 900 ft., 8 mi. W Lagunas, on Mexican National Railroad, Isthmus of Tehuantepec, Oaxaca. Known only from the type locality.

Nyctomys sumichrasti salvini (Tomes)

1862. *Hesperomys* (*Myoxomys*) *salvini* Tomes, Proc. Zool. Soc. London, p. 284, for 1861, April, type from Dueñas, Sacatepequez, Guatemala.
1916. *N[yctomys]. s[umichrasti]. salvini*, Goldman, Proc. Biol. Soc. Washington, 29:155, September 6.

MARGINAL RECORDS (Goodwin, 1934:50).—Guatemala: Panjachel [*sic*]; San Lucas; type locality.

Nyctomys sumichrasti sumichrasti (Saussure)

1860. *H[esperomys]. sumichrasti* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:107, March, type from eastern slope of mountains in Veracruz.
1902. *N[yctomys]. sumichrasti*, Bangs, Bull. Mus. Comp. Zool., 39(2):30, April.

MARGINAL RECORDS.—Veracruz: Jalapa (J. A. Allen and Chapman, 1897:204); 20 km. E Jesús Carranza (24137 KU); 35 km. SE Jesús Carranza (32166 KU); 25 km. SE Jesús Carranza (32158 KU); Coscomatepec, 5000 ft. (30581 KU).

Nyctomys sumichrasti venustulus Goldman

1916. *Nyctomys sumichrasti venustulus* Goldman, Proc. Biol. Soc. Washington, 29:155, September 6, type from Greytown [= San Juan del Norte], Nicaragua.

MARGINAL RECORDS.—Nicaragua: Escondido River, 45 mi. from Bluefields (Goldman, 1916:156); type locality. Costa Rica: Pacuare (Goodwin, 1946:405); Cataratos San Carlos (*ibid.*).

Genus Otonyctomys Anthony—Yucatán Vesper Rat

1932. *Otonyctomys* Anthony, Amer. Mus. Novit., 586:1, November 16. Type, *Otonyctomys hatti* Anthony.

Resembling, and closely related to, *Nyctomys* but auditory bullae much larger, cheek-teeth smaller, and tarsus narrower. Anterior margin of zygomatic plate approximately perpendicular to palatal plane. Two pairs of inguinal mammae (after Anthony, 1932:1).

This genus is represented in collections by only the holotype and 2 topotypes of *O. hatti*.

Otonyctomys hatti Anthony
Yucatán Vesper Rat

1932. *Otonyctomys hatti* Anthony, Amer. Mus. Novit., 586:1, November 16, type from Chichén-Itzá, Yucatán. Known only from the type locality.

External measurements of a topotype are: 231; 127; 23; ear from notch, 14. Upper parts nearly uniform russet to hazel, darkest on back; sides tawny to ochraceous-tawny; upper sides of feet whitish with wash of buff or tawny tones; underparts white with creamy wash; tail bone-brown above and below. See characters for the genus.

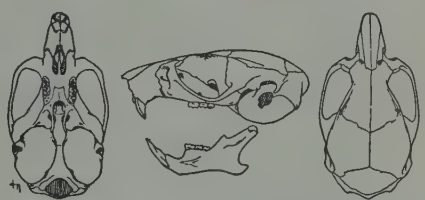


Fig. 326. *Otonyctomys hatti*, Chichén-Itzá, Yucatán, No. 91190 A.M., ♂, X 1.

Genus Reithrodontomys Giglioli—Harvest Mice

Revised by A. H. Howell, N. Amer. Fauna, 36:1–97, 7 pls., June 5, 1914. Latin American species revised by Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:1–255, 9 pls., January 16, 1952.

1874. *Reithrodontomys* Giglioli, Boll. Soc. Geogr. Ital., Roma, 11:326, May-July. Type by subsequent selection (A. H. Howell, N. Amer. Fauna, 36:13, June 5, 1914), *Reithrodon megalotis* Baird.
1874. *Ochetodon* Coues, Proc. Acad. Nat. Sci. Philadelphia, p. 184, December 15. No type selected; included species of both subgenera.

External measurements: 114–238; 48–145; 15–25. Tail slender, scaly, scantily haired; ears conspicuous, sometimes large; soles of hind feet with 6 tubercles; mammae, pec. 1, ing. 2 = 6. Skull comparatively smooth, little sculptured; zygomata slender; outer wall of infraorbital foramen a broad,

thin lamina; anterior palatine foramina long and separated by a thin septum, terminating approximately at level of anterior end of tooth-row; posterior border of palate usually truncate, but often with small, median spine; tympanic bullae moderately inflated, arranged obliquely with relation to longitudinal axis of skull; upper incisors with deep median groove; molars tuberculate, rooted, tubercles arranged in 2 longitudinal series.

According to Hooper (1952a:13), mice of this genus molt at least twice before growing the adult pelage. There seems to be at least one annual molt thereafter. The juvenal pelage is dullest and more or less plumbeous. The adult pelage is brightest.

Harvest mice live in a wide variety of habitats from marshy sea-side situations to tropical forests. Nevertheless, the mice usually are associated with stands of short, and often sparse, grasses. Many, perhaps all, species construct globular nests of grass and other fine vegetation. Most nests are above ground in grasses, low shrubs, or even small trees, but some winter nests are in burrows and small crevices.

The food is principally seeds; the mice sometimes bend a grass stem to the ground and then cut off the head of seeds. Harvest mice do not thrive on cultivated land and are of no great economic importance.

Breeding seasons are not sharply defined in the genus except in areas of severe winter climate. There is evidence that breeding ceases during cold weather.

KEY TO NORTH AMERICAN SPECIES OF REITHRODONTOMYS
(adapted from Hooper, 1952a:24–31)

1. Occurring in the United States.
   2. First primary fold of M3 at least as long as 2nd primary fold, each usually extending more than halfway across crown; worn occlusal surface of left m3 S-shaped. . . . . *R. fulvescens*, p. 591
   2′. First primary fold of M3 distinctly shorter than 2nd primary fold, extending less than halfway across crown; worn occlusal surface of left m3 C-shaped.
      3. Distinct labial ridge, often with cusplets, on m1–2; major fold and 2nd primary fold in M1–2 tend to coalesce, isolating anterior cusps from posterior cusps; occurring in southeastern United States. . . . . *R. humulis*, p. 584
      3′. No distinct labial ridge on m1–2; major fold and 2nd primary fold in M1–2 meet but do not coalesce; and thus isolate anterior cusps from posterior cusps; not occurring in southeastern United States.
         4. Breadth of braincase not exceeding 9.6; rostrum short and broad; tail shorter than head and body; occurring in Great Plains and southwestern United States. . . . . *R. montanus*, p. 582
         4′. Breadth of braincase more than 9.5; rostrum longer and narrower; tail approximately equal to, or longer than, head and body.
            5. Fur of upper parts long, dense, heavily pigmented; ears blackish; occurring in salt marshes in vicinity of San Francisco Bay, California. . . . . *R. raviventris*, p. 588
            5′. Fur of upper parts shorter and less dense, varying from pale buff to reddish brown; ears buffy or fuscous; not occurring in salt marshes in vicinity of San Francisco Bay, California. . . . . *R. megalotis*, p. 584
1′. Occurring south of United States.
   6. Occurring in México.
      7. Second primary fold in m3 well developed; m3 resembling but smaller than m2; zygomatic plate little if any broader than mesopterygoid fossa (except in some *gracilis*); mesopterygoid fossa approximately as wide as either pterygoid fossa (except in some *gracilis*); occurring in eastern and southern México.
         8. Zygomata weak, especially anteriorly; braincase deep and barely narrower than zygomatic breadth; breadth of zygomatic plate less than 1.5; rostrum long, narrow; ear (from notch) barely shorter than hind foot; occurring usually above 8500 feet in central and southern México. . . . . *R. microdon*, p. 598
         8′. Zygomata strong, usually 0.5–1.0 broader than braincase; breadth of zygomatic plate more than 1.4; rostrum relatively short, broad; ear (from notch) usually 3–4 less than hind foot; occurring usually below 8500 ft.
            9. Length of skull usually less than 22; if more, then length of incisive foramina less than 4; frontals broad and flattened interorbitally; hind feet whitish or dusky above; occurring in tropical lowlands of southern México. . . . . *R. gracilis*, p. 595
            9′. Length of skull usually more than 22; if less, then length of incisive foramina more than 4.0; frontals strongly constricted and not markedly flattened (but broad interorbitally); hind feet dusky above; occurring above 1000 ft. . . . . *R. mexicanus*, p. 596

7′. Second primary fold in m3 faint or absent; m3 not resembling m2 in form; zygomatic plate broader than mesopterygoid fossa; mesopterygoid fossa not more than ¾ as wide as either pterygoid fossa; not restricted to eastern or southern México.
10. First primary fold of M3 at least as long as 2nd primary fold, each extending more than halfway across crown; major fold well developed, sometimes continuous with 1st primary fold; worn occlusal surface of left m3 E-shaped.
11. Zygomatic breadth more than 11.9; interorbital breadth more than 3.4; supraorbital self trenchant or beaded; tail unicolor or barely paler below; duskiness of tarsi extending to dorsum of hind feet. . . . . *R. hirsutus*, p. 594
11′. Zygomatic breadth less than 11.9; interorbital breadth less than 3.4; supraorbital shelf neither trenchant nor beaded, although sometimes slightly elevated; tail paler below than above, usually sharply bicolor; hind feet whitish or buffy above, not dusky. *R. fulvescens*, p. 591
10′. First primary fold of m3 shorter than 2nd primary fold; major fold indistinct, not more than a shallow indentation on lingual face of tooth; worn occlusal surface of m3 C-shaped.
12. Breadth of braincase more than 10.7; tail more than 90.
13. No buffy hairs on inner surfaces of ears; ears 17–19 from notch to tip; rostrum long, narrow; interorbital region strongly constricted, hourglass-shaped; occurring above 9000 ft. in highlands of central México. . . . . *R. chrysopsis*, p. 589
13′. Some buffy hairs on inner surfaces of ears (magnification sometimes required to see same); ears less than 18; rostrum and interorbital region broader; occurring below 9000 ft. in central and southern México. . . . . *R. sumichrasti*, p. 589
12′. Breadth of braincase less than 10.7; tail usually less than 85 (never more than 100).
14. Tail shorter than head and body.
15. Total length less than 140; tail less than 95 per cent of length of head and body; breadth of braincase usually less than 9.8.
16. Faint labial ridge on M1–2; tarsi whitish or whitish with thin longitudinal dusky line; pre- and post-auricular areas bright buffy; occurring in coastal region of Sonora. . . . . *R. burti*, p. 583
16′. No labial ridge on M1–2; tarsi extensively dusky; head, pre- and post-auricular areas grayish buff; not occurring in coastal region of Sonora. *R. montanus*, p. 582
15′. Total length more than 140; tail more than 90 per cent of length of head and body; breadth of braincase more than 9.6. . . . . *R. megalotis*, p. 584
14′. Tail longer than head and body.
17. Breadth of mesopterygoid fossa more than 1.0, and approximately equal to distance between posterior palatine foramina; tail more than 75, usually more than 85. . . . . *R. sumichrasti*, p. 589
17′. Breadth of mesopterygoid fossa less than 1.3, and less than distance between posterior palatine foramina; tail usually less than 85. . . . . *R. megalotis*, p. 584
6′. Occurring south of México.
18. Second primary fold indistinct or absent in m3; m3 unlike m2 in form; zygomatic plate broader than mesopterygoid fossa; mesopterygoid fossa narrower than either pterygoid fossa.
19. First primary fold in M3 at least as long as 2nd primary fold, each extending more than halfway across crown; major fold well developed, sometimes confluent with first primary fold; in m3 worn occlusal surface of left tooth S-shaped. . . . . *R. fulvescens*, p. 591
19′. First primary fold in M3 shorter than 2nd primary fold; major fold indistinct, not more than a shallow indentation on lingual surface of tooth; worn occlusal surface of m3 C-shaped. *R. sumichrasti*, p. 589
18′. Second primary fold well developed in m3, usually appearing as posterior 1 of 2 internal folds; m3 similar to but smaller than m2; zygomatic plate little if any broader than mestopterygoid fossa; mesopterygoid fossa approximately as broad as either pterygoid fossa.
20. Hind foot 22–26; length of molar tooth-row 3.9–4.5.
21. Interorbital breadth more than 4.0; length of rostrum (measured from the shallow notch lying on superior orbital border of zygomatic arch [lateral to lacrimal bone] to tip of nasal on same side) more than 9.0; occurring in mountains of Costa Rica and Panamá above 7000 ft. . . . . *R. creper*, p. 599
21′. Interorbital breadth less than 4.1; length of rostrum less than 9.2; occurring in mountains of Guatemala above 8000 ft. . . . . *R. tenuirostris*, p. 599
20′. Hind foot less than 22; length of molar tooth-row less than 3.9.
22. Greatest length of skull more than 24.

23. Breadth of zygomatic plate less than 1.5; zygomatic breadth less than 12, approximately equal to breadth of braincase; depth of braincase more than 9.2. . . . . *R. rodriguezi*, p. 599
23′. Breadth of zygomatic plate 1.5 or more; zygomatic breadth more than 12, and approximately 0.5–1.0 wider than braincase; depth of braincase less than 9.3. . . . . *R. mexicanus*, p. 596

22′. Greatest length of skull less than 24.
24. Braincase highly inflated; zygomatic breadth barely more than breadth of braincase; rostrum long, narrow; occurring in mountains of Guatemala above 8500 ft. . . . . *R. microdon*, p. 598
24′. Braincase moderately inflated; zygomatic breadth approximately 0.5–1.0 wider than braincase; rostrum broader; not restricted to mountains of Guatemala.
25. Length of rostrum less than 7; length of incisive foramina less than 4.
26. Hind feet dusky above; occurring in lowlands of eastern Panamá. . *R. darienensis*, p. 596
26′. Hind feet whitish or dusky above; occurring north of Panamá. . . . *R. gracilis*, p. 595
25′. Length of rostrum more than 7; length of incisive foramina more than 3.9.
27. Length of molar tooth-row less than 3.2.
28. Depth of braincase less than 8.6; dorsal surface of skull comparatively flat.
29. Hind feet dusky above; fur of upper parts long and dusky; tail longer than 100, about 150 per cent of length of head and body; zygomatic plate less than 1.5 wide; occurring in humid highlands of Costa Rica. *R. brevirostris*, p. 598
29′. Hind feet whitish or lightly dusky above; fur of upper parts bright reddish buff and moderately short; tail usually shorter than 105, less than 140 per cent of length of head and body; zygomatic plate more than 1.5 wide; occurring in tropical lowlands. . . . . *R. gracilis*, p. 595
28′. Depth of braincase more than 8.4; dorsal surface of skull convex. *R. mexicanus*, p. 596
27′. Length of molar tooth-row more than 3.2.
30. Length of skull less than 22.5; depth of skull less than 8.5; tail less than 105; occurring in tropical lowlands. . . . . *R gracilis*, p. 595
30′. Length of skull more than 22; depth of braincase more than 8.3; tail rarely less than 100; occurring above 3000 ft. . . . . *R. mexicanus*, p. 596

Subgenus Reithrodontomys Giglioli

1853. *Reithrodon* Le Conte, Proc. Acad. Nat. Sci. Philadelphia, p. 413. Type, *Mus Le Contii* Audubon and Bachman [= *Mus humulis* Audubon and Bachman]. Not *Reithrodon* Waterhouse, 1837.
1874. *Reithrodontomys* Giglioli, Boll. Soc. Geogr. Ital., Roma, 11:326, May-July. Type, *Reithrodon megalotis* Baird.
1903. *Rhithrodontomys* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3:164, May 7, an emendation. *Rhithrodontomys peninsulae* is the combination used.

The subgenus *Reithrodontomys* differs from the subgenus *Aporodon* in: That part of skull anterior to least interorbital constriction approximately equal in length to the part posterior to interorbital constriction; braincase moderately inflated, extending laterally slightly beyond anterolateral limits of zygomatic arches; zygomatic plate much broader than mesopterygoid fossa (except in *R. hirsutus*); pterygoid hamulae only slightly inflated, and barely, if at all, reflexed laterad.

Reithrodontomys montanus
Plains Harvest Mouse

External measurements: 107–143; 48–63; 14–17; 12–16. The color of this species varies geographically in such a way that where it occurs with another species the 2 may be almost indistinguishable on the basis of color. This is the case in the Great Plains, where *R. montanus* and *R. megalotis* occur together. Close inspection reveals, nevertheless, that *R. montanus* has a middorsal stripe (lacking in *R. megalotis* of the Great Plains), narrower blackish dorsal stripe on tail, and white instead of gray venter. In general the upper parts are pale gray to buffy gray washed with fulvous and sprinkled with black hairs, especially middorsally; underparts white. Also, *R. montanus* is smaller.

R. montanus is principally an upland species and occurs in stands of short, sparse grass. After a gestation period of 21 days, 2–5 (av. 2.9) young are born.

Reithrodontomys montanus albescens Cary

1903. *Reithrodontomys albescens* Cary, Proc. Biol. Soc. Washington, 16:53, May 6, type from 18 mi. NW Kennedy, Cherry Co., Nebraska.
1911. *Reithrodontomys montanus albescens* Cary, N. Amer. Fauna, 33:110, August 17.

Fig. 327. *Reithrodontomys montanus albescens,* 2 mi. NE Runnymede, Kansas, No. 12685 K.U., ♂, X 1½.

MARGINAL RECORDS.—Wyoming: ¾ mi. N, 3/10 mi. E Rockypoint, 3800 ft. (32556 KU). South Dakota: 15 mi. from mouth Belle Fourche River (A. H. Howell, 1914:23). Nebraska: Niobrara (*ibid.*). Kansas (Cockrum, 1952:169): ½ mi. W Downs; 2 mi. NE Runnymede; 17 mi. SW Meade. Colorado: Three Corners (Warren, 1942:195); Furnace Canyon (Miller, 1928:338); Loveland (A. H. Howell, 1914: 23). Wyoming: 2 mi. S, ½ mi. E Lusk, 5000 ft. (41913 KU).

Reithrodontomys montanus griseus V. Bailey

1905. *Reithrodontomys griseus* V. Bailey, N. Amer. Fauna, 25:106, October 24, type from San Antonio, Bexar Co., Texas.

1935. *Reithrodontomys montanus griseus,* Benson, Jour. Mamm., 16:141, May 15.

MARGINAL RECORDS.—Nebraska: London (A. H. Howell, 1914:24). Kansas: Lawrence (Cockrum, 1952: 169). Oklahoma: 3 mi. E Wainwright (Blair, 1939:118); 5 mi. N Colbert (McCarley, 1952:107). Texas: 2 mi. N Sivells Bend (Russell, 1953:458); 2 mi. SE College Station (1472 Texas Coöp. Res. Coll.); type locality; Bear Creek, 5 mi. W Hunt (381 Texas Coöp. Res. Coll.); San Angelo (A. H. Howell, 1914:24). New Mexico: 44 mi. NW Roswell (Benson, 1935:141); Santa Rosa (A. H. Howell, 1914: 24). Oklahoma (Blair, 1939:117–118): 8 mi. E Keyes; Alva. Kansas (Cockrum, 1952:169): 3 mi. SE Arkansas City; 8 mi. NE Hutchinson; Concordia.

Reithrodontomys montanus montanus (Baird)

1855. *Reithrodon montanus* Baird, Proc. Acad. Nat. Sci. Philadelphia, 7:335, April, type from Rocky Mts., lat. 39°, probably near upper end of San Luis Valley, Saguache Co., Colorado, according to J. A. Allen (Bull. Amer. Mus. Nat. Hist., 7:124, May 21, 1895), or very probably on Medano Creek, Alamosa Co., Colorado, according to Warren (Mammals of Colorado, p. 196, 1942).

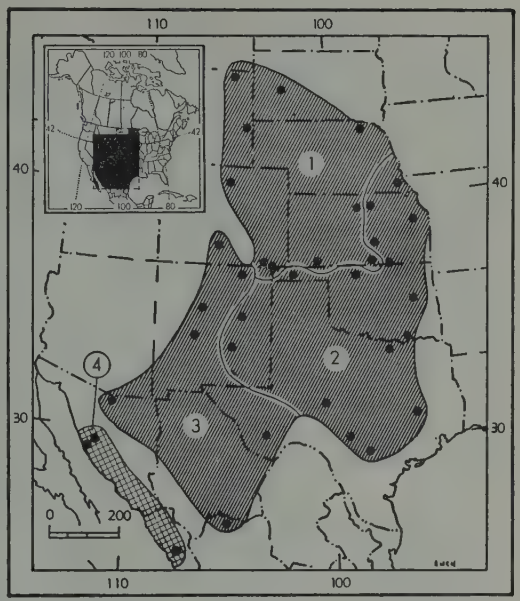
1893. *Reithrodontomys montanus,* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:80, April 28.

MARGINAL RECORDS (Hooper, 1952a:40, unless otherwise noted).—Colorado: type locality. New Mexico: 3 mi. S Raton (V. Bailey, 1932:166). Texas: W of Glass Mts., Brewster Co. Durango: 3 mi. SW Canutillo, 6300 ft. Sonora: 14 mi. S Nogales, 3500 ft. New Mexico: 3 mi. N Socorro; Sandoval.

Reithrodontomys burti Benson
Sonoran Harvest Mouse

1939. *Reithrodontomys burti* Benson, Proc. Biol. Soc. Washington, 52:147, October 11, type from Rancho de Costa Rica, Río Sonora, Sonora.

External measurements: 116–136; 52–66; 16–17; ear, 14–17. Upper parts ochraceous-buff, hairs with black tips, most intense on sides and rump; underparts whitish with plumbeous color of base of hairs conspicuous; ankles white or with fine dusky line; tail-stripe narrow, indistinct. Tail relatively long (70–97 per cent of length of head and body). Skull resembling that of *R. montanus,* but differing in wider interorbital area, broader zygomatic process of maxilla, larger infraorbital foramina and relatively longer nasals.



Map 340. *Reithrodontomys montanus* and *R. burti.*

1. *R. m. albescens*
2. *R. m. griseus*
3. *R. m. montanus*
4. *R. burti*

Hooper (1952:41) considers *R. burti* to be a relict species related to *R. montanus, R. megalotis,* and *R. humulis,* probably closest to *montanus* but in some characters related to *humulis.*

MARGINAL RECORDS.—Sonora: type locality. Sinaloa: 1 mi. S Pericos (61672 KU). Sonora: 11 mi. W Hermosilla, 600 ft. (Hooper, 1952a:43).

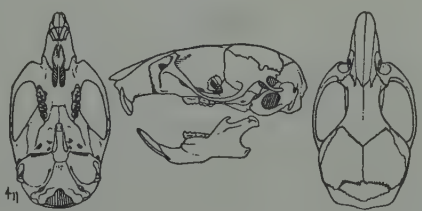


Fig. 328. *Reithrodontomys burti,* Rancho de Costa Rica, Río Sonora, Sonora, No. 82987 M.V.Z., ♀, X 1½.

Reithrodontomys humulis
Eastern Harvest Mouse

External measurements: 107–128; 45–60; 15–17; 8–9. Upper parts rich brown, sometimes faintly washed with grayish, dark middorsal stripe usually present; paler on sides, with clear lateral line usually present; underparts ash colored, often with cinnamon or pinkish suffusion; tail bicolor, fuscous to dark brown above, grayish white below. Braincase narrow, highly arched; nasals and rostrum short, broad; zygomata parallel or slightly narrower anteriorly.

This richly colored little harvest mouse occupies a wide geographic range in the southeastern United States, but within that range is nowhere common.

It is reported as breeding from May to November and producing litters of 2–5 young (Asdell, 1946: 243).

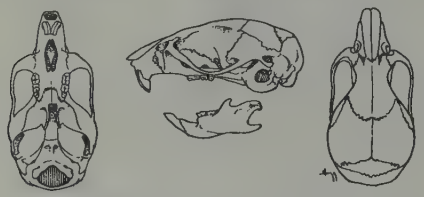


Fig. 329. *Reithrodontomys humulis humulis*, 2 mi. E Silver Springs, Marion Co., Florida, No. 27241 K.U., ♂, X 1¼.

Reithrodontomys humulis humulis (Audubon and Bachman)

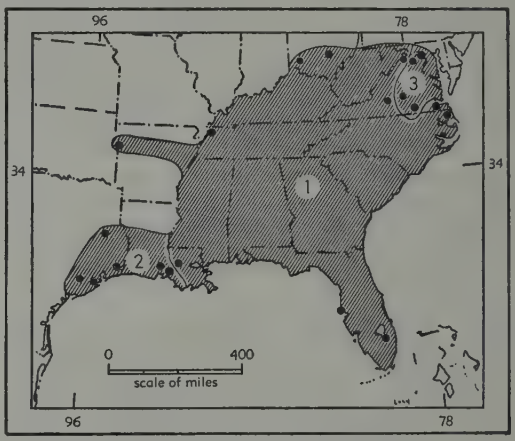
1841. *Mus humulis* Audubon and Bachman, Proc. Acad. Nat. Sci. Philadelphia, 1:97, type from Charleston, Charleston Co., South Carolina.
1907. *Reithrodontomys humulis*, Osgood, Proc. Biol. Soc. Washington, 20:49, April 18.
1842. *Mus carolinensis* Audubon and Bachman, Jour. Acad. Nat. Sci. Philadelphia, 8:306. Type locality, South Carolina (may refer to this species).
1842. *Mus Le Contii* Audubon and Bachman, Jour. Acad. Nat. Sci. Philadelphia, 8:307, type from Georgia.
1895. *Reithrodontomys humulis dickinsoni* Rhoads, Amer. Nat., 29:590, June, type from Willow Oak, Pasco Co., Florida.
1898. *Reithrodontomys lecontii impiger* Bangs, Proc. Biol. Soc. Washington, 12:167, August 10, type from White Sulphur Springs, 2000 ft., Greenbrier Co., West Virginia.

MARGINAL RECORDS (A. H. Howell, 1914:20, unless otherwise noted).—Ohio: Sec. 23, Hocking Twp., Fairfield County (Goslin, 1939:257). Virginia (Handley and Patton, 1947:160): Frederick County; Campbell County; Norfolk County. North Carolina: Currituck, thence down coast to Florida: Ritta (Hooper, 1943:16); Tarpon Springs (Sherman, 1937:115), thence westward along Gulf Coast to Louisiana: University, East Baton Rouge Parish (Hooper, 1943:16). Arkansas: Fort Smith (Sealander, 1956:273). Tennessee: 2 mi. E Open Lake (Goodpaster and Hoffmeister, 1952:367). Ohio: Hamilton County (Hooper, 1943:16).

Reithrodontomys humulis merriami J. A. Allen

1895. *Reithrodontomys merriami* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:119, May 21, type from Austin Bayou, near Alvin, Brazoria Co., Texas.
1914. *Reithrodontomys humulis merriami*, A. H. Howell, N. Amer. Fauna, 36:21, June 5.

MARGINAL RECORDS.—Texas: 1 mi. E Nacogdoches (McCarley and Bradshaw, 1953:516). Louisiana: Mermentau (Hooper, 1943:10); Lafayette (A. H. Howell, 1914:22), thence westward along coast to Texas: Labelle (Blair, 1941:379); type locality; Richmond (Hooper, 1943:10).



Map 341. *Reithrodontomys humulis.*

Guide to subspecies
1. *R. h. humulis*
2. *R. h. merriami*
3. *R. h. virginianus*

Reithrodontomys humulis virginianus A. H. Howell

1940. *Reithrodontomys humulis virginianus* A. H. Howell, Jour. Mamm., 21:346, August 13, type from Amelia, Amelia Co., Virginia.

MARGINAL RECORDS (A. H. Howell, 1940:346, unless otherwise noted).—Maryland: Takoma Park, near Riggs Mill. Virginia: near Triplett (Hooper, 1943:19); type locality; Falls Church.

megalotis-group
Reithrodontomys megalotis
Western Harvest Mouse

External measurements: 118–170; 55–96; 14–20; 10–16. Upper parts of various shades of buffy mixed with dark brown or blackish that sometimes predominates middorsally; buffy tones purest on cheeks, shoulders, and flanks; underparts varying from dark buff to white; tail bicolored, darker above than below. Skull with broad zygomatic plate and broad pterygoid fossae.

There are no absolute characters by which this species can be distinguished from certain of its congeners; usually close comparison must be made

and identification based on the summation of characters.

This is the most widespread of all species of harvest mice and often the commonest. It seems to thrive in areas disturbed by man and, given suitable habitat, is not uncommon in urban situations. The preferred habitat is thick stands of grass, especially, in more arid parts of its range, near water. Like other members of the genus, it is primarily a seed-eater and stores considerable amounts of food. At Lawrence, Kansas, it eats seeds of foxtail, switchgrass, Indian grass, false redtop, brome, and side-oats grama. In spring succulent stems are eaten and in summer many insects, especially grasshoppers are taken.

Hall (1946:500) reported that in Nevada pregnant females contained from 1 to 6 embryos (mode and average, 4). Svihla (1931:364) reported a gestation period of 23–24 days and as many as 7 embryos. In the northern parts of its range this mouse breeds in late spring and summer; possibly it breeds the year round in more southerly latitudes.

Reithrodontomys megalotis alticolus Merriam

1901. *Reithrodontomys saturatus alticolus* Merriam, Proc. Washington Acad. Sci., 3:556, November 29, type from Cerro San Felipe, 10,000 ft., Oaxaca.
1914. *Reithrodontomys megalotis alticolus*, A. H. Howell, N. Amer. Fauna, 36:37, June 5.

MARGINAL RECORDS (Hooper, 1952a:61).—Oaxaca: Tamazulapan, somewhere between 6500 and 7500 ft.; 3 mi. N Ozoletepec, 10,000 ft.; Miahuatlán, 5100 ft.; Tlapacingo, 5200 ft. (?).

Reithrodontomys megalotis amoles A. H. Howell

1914. *Reithrodontomys amoles* A. H. Howell, N. Amer. Fauna, 36:40, June 5, type from Pinal de Amoles, approximately 7500 ft., Querétaro. Known only from the type locality.
1952. *Reithrodontomys megalotis amoles*, Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:64, January 16.

Reithrodontomys megalotis arizonensis J. A. Allen

1895. *Reithrodontomys arizonensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:134, May 21, type from Rock Creek, 8000 ft., Chiricahua Mts., Cochise Co., Arizona. Known only from the type locality.
1914. *Reithrodontomys megalotis arizonensis*, A. H. Howell, N. Amer. Fauna, 36:38, June 5.

Reithrodontomys megalotis aztecus J. A. Allen

1893. *Reithrodontomys aztecus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:79, April 28, type from La Plata, San Juan Co., New Mexico. (See J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:125, May 21, 1895.)
1914. *Reithrodontomys megalotis aztecus*, A. H. Howell, N. Amer. Fauna, 36:30, June 5.

MARGINAL RECORDS.—Colorado: Rifle (Warren, 1942:196); Florida (16007 KU); Arboles (Warren, 1942: 196). New Mexico (A. H. Howell, 1914:30); Rinconada; Guadalupita. Kansas (Cockrum, 1952:167): 7½ mi. W, 1 mi. N Manter; 9 mi. W, 2 mi. S Santana; 17 mi. W Meade. New Mexico: Las Vegas (A. H. Howell, 1914:30); Manzano Mts. (V. Bailey, 1932:164); Datil (*ibid.*). Arizona: Canyon de Chelly (A. H. Howell, 1914:30). Utah (Durrant, 1952: 299): ¾ mi. NW Bluff, 4500 ft.; Monticello. Colorado: Grand Junction (Warren, 1942:196).

Reithrodontomys megalotis caryi A. H. Howell

1935. *Reithrodontomys megalotis caryi* A. H. Howell, Jour. Mamm., 16:143, May 15, type from Medano Ranch, 15 mi. NE Mosca, Alamosa Co., Colorado.

MARGINAL RECORDS.—Colorado: Crestone (Warren, 1942:197); type locality; 9 mi. E Center (13745 AMNH).

Reithrodontomys megalotis catalinae (Elliot)

1904. *Rhithrodontomys catalinae* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3:246, January 7, type from Santa Catalina Island [near Avalon], Santa Barbara Islands, California. Known only from Santa Catalina Island.
1952. *Reithrodontomys megalotis catalinae*, Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:23, January 16.

Reithrodontomys megalotis distichlis von Bloeker

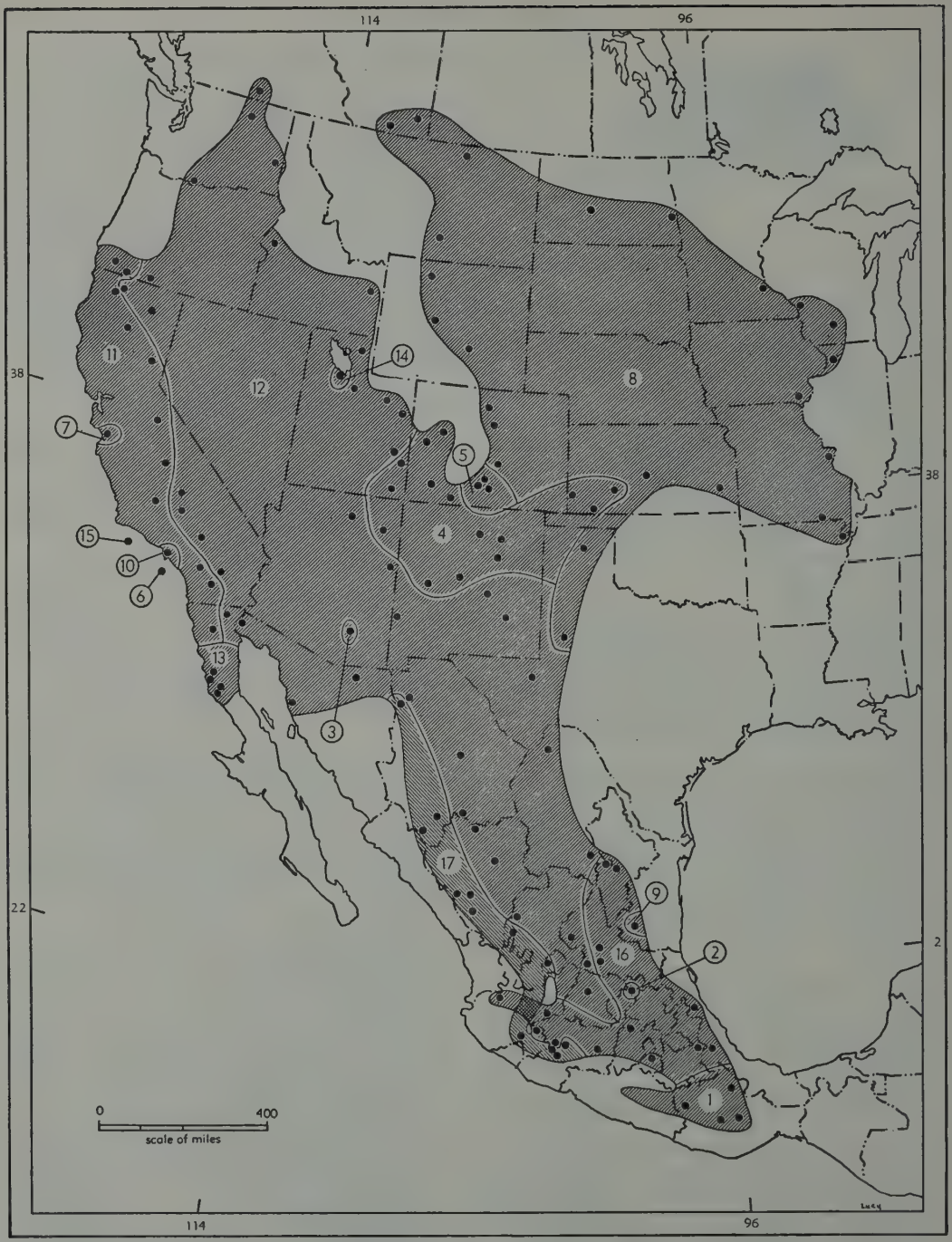
1937. *Reithrodontomys megalotis distichlis* von Bloeker, Proc. Biol. Soc. Washington, 50:155, September 10, type from salt marsh at mouth of Salinas River, Monterey Co., California.

MARGINAL RECORDS (Hooper, 1952a:219).—California: *Moss Landing, Elkhorn Slough*; type locality; *Seaside Lagoon.*

Reithrodontomys megalotis dychei J. A. Allen

1895. *Reithrodontomys dychei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:120, May 21, type from Lawrence, Douglas Co., Kansas.
1914. *Reithrodontomys megalotis dychei*, A. H. Howell, N. Amer. Fauna, 36:30, June 5.
1895. *Reithrodontomys dychei nebrascensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:122, May 21, type from Kennedy, Cherry Co., Nebraska.
1944. *Reithrodontomys megalotis pectoralis* Hanson, Field Mus. Nat. Hist., Publ. 564, Zool. Ser., 29:205, October 26, type from Westpoint, Columbia Co., Wisconsin (regarded as inseparable from *dychei* by Hoffmeister and Warnock, Trans. Illinois Acad. Sci., 47:162, 1955).

MARGINAL RECORDS (A. H. Howell, 1914:32, unless otherwise noted).—Alberta: Medicine Hat (Moore, 1952: 143). Montana: 1 mi. W, 1 mi. N Malta, 2248 ft. (27716 KU). North Dakota: Fort Clark; Fargo (V. Bailey, 1927:80).



Map 342. *Reithrodontomys megalotis.*

Guide to subspecies

1. *R. m. alticolus*
2. *R. m. amoles*
3. *R. m. arizonensis*
4. *R. m. aztecus*
5. *R. m. caryi*
6. *R. m. catalinae*
7. *R. m. distichlis*
8. *R. m. dychei*
9. *R. m. hooperi*
10. *R. m. limicola*
11. *R. m. longicaudus*
12. *R. m. megalotis*
13. *R. m. peninsulae*
14. *R. m. ravus*
15. *R. m. santacruzae*
16. *R. m. saturatus*
17. *R. m. zacatecae*

Minnesota: Rosemount (Beer and MacLeod, 1955:176). Wisconsin: LaCrosse (Hanson, 1944:206); Prairie du Sac (*ibid.*). Illinois: Mt. Carroll (Hoffmeister and Warnock, 1955:163). Iowa: Hillsboro (Scott, 1937:75). Missouri: St. Louis. Arkansas: Leachville (Sealander, 1954:430). Missouri: Thayer (Hanson, 1944:206). Kansas (Cockrum, 1952:167): Neosho Falls; 3 mi. N, 2 mi. W Hoisington. Texas (Blair, 1954b:249): Lamesa; Stinnett. Colorado: Cañon City; Golden; 16 mi. W Loveland, 6840 ft. (26734 KU). Wyoming: Splitrock; 3/10 mi. NW Milford, 5357 ft. (32565 KU); 13 mi. N, 1 mi. E Cody, 5200 ft. (37604 KU). Montana: Billings. Alberta: Mills River (Moore, 1952:143).

Reithrodontomys megalotis hooperi Goodwin

1954. *Reithrodontomys megalotis hooperi* Goodwin, Amer. Mus. Novit., 1660:1, May 25, type from Rancho del Cielo, 5 mi. NW Gómez Farías, 3500 ft., Tamaulipas. Known only from the type locality.

Reithrodontomys megalotis limicola von Bloeker

1932. *Reithrodontomys megalotis limicola* von Bloeker, Proc. Biol. Soc. Washington, 45:133, September 9, type from Playa del Rey, Los Angeles Co., California.

MARGINAL RECORDS (Hooper, 1952a:219).—California: *Point Mugu*; type locality; *Anaheim Bay*.

Reithrodontomys megalotis longicaudus (Baird)

1858. *Reithrodon longicauda* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):451, July 14, type from Petaluma, Sonoma Co., California.
1913. *Reithrodontomys megalotis longicauda*, Grinnell, Proc. California Acad. Sci., ser. 4, 3:303, August 28.
1893. *Reithrodontomys pallidus* Rhoads, Amer. Nat., 27: 835, September, type from Santa Ysabel, San Jacinto Mts., San Diego Co., California.
1899. *Reithrodontomys klamathensis* Merriam, N. Amer. Fauna, 16:93, October 28, type from Big Spring (Mayten), Shasta Valley, Siskiyou Co., California.

MARGINAL RECORDS.—Oregon (V. Bailey, 1936:190): Grants Pass; Ashland. California (Grinnell, 1933:170, unless otherwise noted): Scott River Valley; Battle Creek Meadows; Portola (53205 KU); El Portal; Dunlap; Bakersfield; Hemet Lake, San Jacinto Mts.; Vallecito. Baja California: Rancho Viejo, 15 mi. E Alamos (A. H. Howell, 1914: 34), thence northward along coast, except for the ranges of *limicola* and *distichlis*, to point of beginning.

Reithrodontomys megalotis megalotis (Baird)

1858. *Reithrodon megalotis* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):451, July 14, type from between Janos, Chihuahua, and San Luis Springs, Grant Co., New Mexico.
1893. *Reithrodontomys megalotis*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:79, April 28.
1895. *Reithrodontomys megalotis deserti* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:127, May 21, type from Oasis Valley, Nye Co., Nevada.
1903. *Reithrodontomys megalotis sestinensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:602, November 12, type from Río Sestín, 7500 ft., northwestern Durango.
1914. *Reithrodontomys megalotis nigrescens* A. H. Howell, N. Amer. Fauna, 36:32, June 5, type from Payette, Payette Co., Idaho.

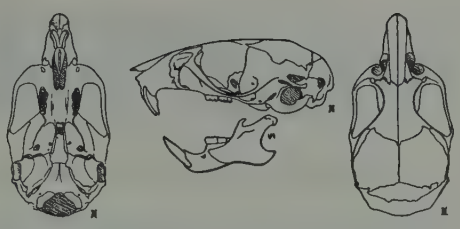


Fig. 330. *Reithrodontomys megalotis megalotis*, Crystal Spring, Lincoln Co., Nevada, No. 52998 M.V.Z., ♂, X 1½.

MARGINAL RECORDS.—British Columbia: NE end Skaha (Dog) Lake, just S of Penticton (Holland, 1942:60). Washington (Dalquest, 1948:325): Timentwa; Colfax. Idaho: Crane Creek, 15 mi. E Midvale (Davis, 1939:284); Menan (*op. cit.*:281). Utah (Durrant, 1952:297–298, unless otherwise noted): Logan; Corner Canyon, near Draper Tunnel, 5000 ft.; 2 mi. E Duchesne (Durrant, *et al.*, 1955:76); Willow Creek, 25 mi. S Ouray, 5250 ft.; Highway 160, 14 mi. N Moab, 4500 ft. Arizona: vicinity of Tuba (Sumner and Swarth, 1924:97); Zuñi River (A. H. Howell, 1914:29). New Mexico: San Francisco River Valley, near Alma (V. Bailey, 1932:162); Gallo Canyon, 35 mi. E Corona (A. H. Howell, 1914:29); Roswell (V. Bailey, 1932:162). Texas: 25 mi. W Fort Stockton (A. H. Howell, 1914:29). Coahuila: 35 mi. S, 14 mi. E Boquillas, 2350 ft. (Baker, 1956:253); Saltillo, 4800 ft. (Hooper, 1952a:55). San Luis Potosí (Dalquest, 1953b:130): 2 km. E Illescas; 2 km. NE Arriaga. Guanajuato: Santa Rosa, 8200 ft. ? (Hooper, 1952a: 55). Zacatecas: 8 mi. W, 1 mi. N Sombrerete, 7800 ft. (*ibid.*). Durango (*ibid.*): 14 mi. E Zarca, 6650 ft.; 3 mi. SW Canutillo, 6300 ft. Chihuahua (*ibid.*): 2 mi. W Parral, 6200 ft.; Chihuahua, 4700 ft.; Casas Grandes, 4800 ft. Sonora (*ibid.*): 5 mi. N Cananea, 4750 ft.; Puerto de Lobos, near sea level; Cienega Well, 50 ft. ? Baja California: Gardners Lagoon (A. H. Howell, 1914:29). California (Grinnell, 1933:169–170): Mecca; Victorville; Tehachapi; Bodfish; Bieber; Montague. Oregon: Klamath Lake basin (V. Bailey, 1936:190). Washington: Maryhill (Dalquest, 1948:325).

Reithrodontomys megalotis peninsulae (Elliot)

1903. *Rhithrodontomys peninsulae* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3(10):164, May 7, type from San Quintín, Baja California.
1914. *Reithrodontomys megalotis peninsulae*, A. H. Howell, N. Amer. Fauna, 36:35, June 5.

MARGINAL RECORDS (A. H. Howell, 1914:35).—Baja California: Socorro; Pozo Luciano, NW slope Sierra San Pedro Mártir Mountains; Rosario; type locality; *San Telmo*.

Reithrodontomys megalotis ravus Goldman

1939. *Reithrodontomys megalotis ravus* Goldman, Jour. Mamm., 20:355, August 14, type from north end Stansbury Island, 4250 ft., Great Salt Lake, Tooele Co., Utah.

MARGINAL RECORDS (Durrant, 1952:298).—Utah: type locality; *Grantsville*.

Reithrodontomys megalotis santacruzae Pearson

1951. *Reithrodontomys megalotis santacruzae* Pearson, Jour. Mamm., 32:366, August 23, type from Prisoners Harbor, Santa Cruz Island, Santa Barbara Co., California. Known only from Santa Cruz Island.

Reithrodontomys megalotis saturatus J. A. Allen and Chapman

1897. *Reithrodontomys saturatus* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:201, June 16, type from Las Vigas, 8000 ft., Veracruz.
1914. *Reithrodontomys megalotis saturatus,* A. H. Howell, N. Amer. Fauna, 36:36, June 5.
1901. *Reithrodontomys saturatus cinereus* Merriam, Proc. Washington Acad. Sci., 3:556, November 29, type from near Chalchicomula (San Andrés), Puebla.

MARGINAL RECORDS (Hooper, 1952a:59–60, unless otherwise noted).—Coahuila: *Diamante, 7500 ft.* (35920 KU). 12 mi. E San Antonio de las Alazanas, 9000 ft. (33150 KU). Nuevo León: 12 mi. N Galeana, 7000 ft. Veracruz: 3 km. E Las Vigas, 8000 ft. (19386 KU); Volcán de Orizaba, timberline. Puebla: Chalchicomula, 8400 ft. Morelos: C. Cruz del Morelos, 2440 m. (28323 KU). Michoacán: 10 mi. SE Pátzcuaro, 9200 ft.; 2 mi. NNW San Juan, 7700 ft. Jalisco: ¾ mi. NW Mazamitla (Hooper, 1955: 10); 1 mi. WSW Ameca, 4000 ft.; vicinity of Ocotlán, 5000 ft. México: Atlacomulco, 8200 ft. San Luis Potosí (Dalquest, 1953b:129): 3 km. SW San Isidro; Leoncito.

Reithrodontomys megalotis zacatecae Merriam

1901. *Reithrodontomys megalotis zacatecae* Merriam, Proc. Washington Acad. Sci., 3:557, November 29, type from Sierra de Valparaíso, Zacatecas.
1901. *Reithrodontomys megalotis obscurus* Merriam, Proc. Washington Acad. Sci., 3:558, November 29, type from Sierra Madre, near Guadalupe y Calvo, Chihuahua.

MARGINAL RECORDS (Hooper, 1952a:64, unless otherwise noted).—Chihuahua: 9 mi. SE Colonia García, 8200 ft.; Ranchería, 12 mi. E Guachochic, 6250 ft. Durango: Laguna del Progreso (Goodwin, 1954:11). Zacatecas: type locality. Aguascalientes: Sierra Fría (Hooper, 1955:10). Jalisco: N slope El Nevado de Colima, 7300 ft. Michoacán: Nahuatzen, 8500 ft.; 9 mi. SE Pátzucaro, 8000 ft.; Cerro Tancítaro, 1 mi. N Apo, 7000 ft. Durango: El Salto, between 7600 and 8400 ft.; 1½ mi. W San Luis (Hooper, 1955:10). Chihuahua: Sierra Madre near Guadalupe y Calvo, between 7000 and 9000 ft.

Reithrodontomys raviventris
Salt-marsh Harvest Mouse

External measurements: 135–162; 64–88; 16–19. Upper parts pinkish cinnamon interspersed with black hairs, especially middorsally; underparts pinkish cinnamon or whitish; hind feet dark brown or whitish; tail dark brown or blackish above, paler, sometimes almost white, below. As compared with *R. megalotis longicaudus,* its geographically nearest congener, *R. raviventris* differs cranially in larger skull with relatively shorter rostrum; nasals and incisive foramina shorter; and zygomata more widely spreading anteriorly.

This unusually dark-colored harvest mouse is limited to the vicinity of San Francisco Bay, California. It lives in the salt marshes where the ground is damp or wet and the marsh plants form a thick mat over a network of interstices.

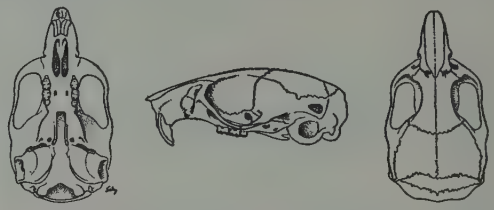


Fig. 331. *Reithrodontomys raviventris raviventris,* Palo Alto, Santa Clara Co., California, No. 3527 M.V.Z., ♀, X 1¼.

Reithrodontomys raviventris halicoetes Dixon

1909. *Reithrodontomys halicoetes* Dixon, Univ. California Publ. Zool., 5:271, August 14, type from 3 mi. S Petaluma, Sonoma Co., California.
1914. *Reithrodontomys raviventris halicoetes,* A. H. Howell, N. Amer. Fauna, 36:42, June 5.

MARGINAL RECORDS.—California: Grand Island, 2 mi. N Knight's Landing (Grinnell, 1933:171); marshes near Avon (Hooper, 1944:49); 5 mi. N San Rafael (*ibid.*); type locality.

Map 343. *Reithrodontomys raviventris.*

1. *R. r. halicoetes* 2. *R. r. raviventris*

Reithrodontomys raviventris raviventris Dixon

1908. *Reithrodontomys raviventris* Dixon, Proc. Biol. Soc. Washington, 21:197, October 20, type from salt marsh near Redwood City, San Mateo Co., California.

MARGINAL RECORDS (Hooper, 1944:47).—California: San Pablo Creek; *marshes along S arm San Francisco Bay*; type locality; vicinity South San Francisco; Corte Madera.

Reithrodontomys chrysopsis
Volcano Harvest Mouse

External measurements: 170–192; 89–108; 19–21; 17–19. Upper parts bright orange-buff mixed with black, black predominant on back and muzzle, buff tones purest on sides; underparts pinkish cinnamon; ocular ring black; ears black; tail sharply bicolor, blackish above, either slightly paler or silvery below. Skull with large, oval braincase (larger than in *tenuirostris, mexicanus,* or *hirsutus*); frontals small, strongly constricted interorbitally; rostrum long, broader than interorbital constriction; both anterior and posterior palatine foramina long, slender; sphenopalatine vacuities large, crescent-shaped; pterygoid fossa broader than mesopterygoid (interpterygoid) fossa; molars high crowned.

Hooper (1952a:87) reported this mouse as occurring in "Cool, shaded, and comparatively moist canyons and slopes that are dominated by fir or short-needled pine forests and frequently . . . enshrouded in clouds."

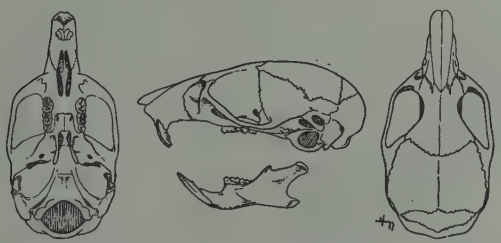
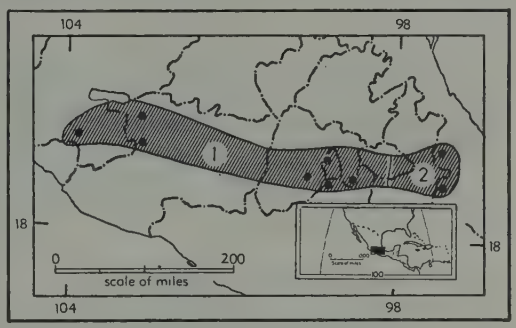


Fig. 332. *Reithrodontomys chrysopsis chrysopsis,* Monte Río Frío, 45 km. ESE Mexico City, México, No. 17979 K.U., ♂, X 1½.

Reithrodontomys chrysopsis chrysopsis Merriam

1900. *Reithrodontomys chrysopsis* Merriam, Proc. Biol. Soc. Washington, 13:152, June 13, type from Volcán Popocatépetl, 11,500 ft., México.
1901. *Reithrodontomys chrysopsis tolucae* Merriam, Proc. Washington Acad. Sci., 3:549, November 29, type from north slope Volcán de Toluca, 11,500 ft., México.
1901. *Reithrodontomys colimae* Merriam, Proc. Washington Acad. Sci., 3:551, November 29, type from near timberline, El Nevado de Colima, 12,000 ft., Jalisco.

MARGINAL RECORDS (Hooper, 1952a:89, unless otherwise noted).—Michoacán: Cerro Patambán, 11,000 ft. Distrito Federal: La Venta, 10,200 ft. México: type locality. Morelos: 2 mi. W Huitzilac (Davis and Russell, 1954:74). México: Salazar, 9000 ft. Michoacán: Cerro Tancítaro, 10,000–12,000 ft. Jalisco: NW slopes El Nevado de Colima, 9500–12,000 ft.



Map 344. *Reithrodontomys chrysopsis.*

1. *R. c. chrysopsis* 2. *R. c. perotensis*

Reithrodontomys chrysopsis perotensis Merriam

1901. *Reithrodontomys perotensis* Merriam, Proc. Washington Acad. Sci., 3:550, November 29, type from Cofre de Perote, 9500 ft., Veracruz.
1952. *Reithrodontomys chrysopsis perotensis,* Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:89, January 16.
1901. *Reithrodontomys orizabae* Merriam, Proc. Washington Acad. Sci., 3:550, November 29, type from Volcán de Orizaba, 9500 ft., Puebla.

MARGINAL RECORDS.—Veracruz: type locality. Puebla: El Volcán de Orizaba, 9500 ft. (Hooper, 1952a:90).

Reithrodontomys sumichrasti
Sumichrast's Harvest Mouse

External measurements: 143–206; 75–123; 17–22; 12–18. "In tone of coloration the races of *sumichrasti* may be arranged in 2 groups. Within each group the color deepens geographically from north to south. The races *sumichrasti, dorsalis, australis,* and *vulcanius* are dark-colored. . . . In each there is an abundance of black dorsally which largely obscures the cinnamon ground color. Thus, the upper parts are blackish and dull. The underparts are similarly somber. . . . The races *nerterus, luteolus,* and *modestus* comprise a group which is brighter in color. In them there is less black dorsally and the cinnamon-tinted bands of the hairs of the underparts obscure the blackish basal bands. The result is a distinctly brighter and on the average more buffy coat in those races" (Hooper, 1952a: 68). Skull with mesopterygoid fossa broad; tympanic bullae small; paracone of M2 not evenly rounded posteriorly but distinctly keeled on pos-

terolabial margin, the keel projecting into 2nd primary fold.

Habitats occupied by this harvest mouse vary from dry, sandy, or rocky soils under moderately xeric conditions, to the damp cloud forests of the tropics.

Reithrodontomys sumichrasti australis J. A. Allen

1895. *Reithrodontomys australis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:328, November 8, type from Volcán de Irazú, Costa Rica.
1952. *Reithrodontomys sumichrasti australis,* Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:82, January 16.

MARGINAL RECORDS.—Costa Rica: type locality; *Altos Escazú, 4000 ft.* (Hooper, 1952a:82).

Reithrodontomys sumichrasti dorsalis Merriam

1901. *Reithrodontomys dorsalis* Merriam, Proc. Washington Acad. Sci., 3:557, November 29, type from Calel, Guatemala.
1952. *Reithrodontomys sumichrasti dorsalis,* Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:78, January 16.

MARGINAL RECORDS (Hooper, 1952a:79–80).—Chiapas: Tumbalá, 5000–5500 ft.; 28 mi. ESE Comitán, San José, 4900 ft. Guatemala: Cobán, 4500 ft.; Volcán Acatenango, Finca Montserrat, 5700 ft.; Volcán Tajumulco, 10,400–13,200 ft. Chiapas: Pueblo Nuevo, 5500 ft.

Reithrodontomys sumichrasti luteolus A. H. Howell

1914. *Reithrodontomys rufescens luteolus* A. H. Howell, N. Amer. Fauna, 36:57, June 5, type from Juquila, 5000 ft., Oaxaca.
1952. *Reithrodontomys sumichrasti luteolus,* Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:77, January 16.
1914. *Reithrodontomys alleni* A. H. Howell, N. Amer. Fauna, 36:59, June 5, type from mountains near Ozolotepec, 10,000 ft., Oaxaca.

MARGINAL RECORDS (Hooper, 1952a:77–78).—Guerrero: 3 mi. W Omilteme, 8200 ft. Oaxaca: type locality; 3 mi. N Ozolotepec, La Cieneguía, 10,000 ft.

Map 345. *Reithrodontomys sumichrasti.*

1. *R. s. australis*
2. *R. s. dorsalis*
3. *R. s. luteolus*
4. *R. s. modestus*
5. *R. s. nerterus*
6. *R. s. sumichrasti*
7. *R. s. vulcanius*

Fig. 333. *Reithrodontomys sumichrasti australis,* SW slope Volcán Irazú, 8500 ft., Prov. Cartago, Costa Rica, No. 26967 K.U., ♀, X 1½.

Reithrodontomys sumichrasti modestus Thomas

1907. *Reithrodontomys modestus* Thomas, Ann. Mag. Nat. Hist., ser. 7, 20:163, August, type from Jinotega, 4650 ft., Nicaragua.
1952. *Reithrodontomys sumichrasti modestus,* Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:80, January 16.
1937. *Reithrodontomys dorsalis underwoodi* Goodwin, Amer. Mus. Novit., 921:2, May 3, type from Monte Verde, 4500 ft., 30 mi. NW Ocotepeque, Ocotepeque, Honduras.

MARGINAL RECORDS (Hooper, 1952a:81–82).—Honduras: Cementerio, 5300 ft.; Cerro Uyuca, 6100 ft. Nicaragua: near San Rafael del Norte, about 5000 ft. El Salvador: Los Esesmiles, 6200–8000 ft. Honduras: Monte Verde, 4500 ft.

Reithrodontomys sumichrasti nerterus Merriam

1901. *Reithrodontomys colimae nerterus* Merriam, Proc. Washington Acad. Sci., 3:551, November 29, type from foothills of El Nevado de Colima, Jalisco.
1952. *Reithrodontomys sumichrasti nerterus,* Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:74, January 16.
1901. *Reithrodontomys levipes otus* Merriam, Proc. Washington Acad. Sci., 3:555, November 29, type from foothills of El Nevado de Colima, Jalisco.
1949. *Reithrodontomys chrysopsis seclusus* Hall and Villa, Proc. Biol. Soc. Washington, 62:163, August 23, type from Mt. Tancítaro, 7800 ft., Michoacán.

MARGINAL RECORDS (Hooper, 1952a:76, unless otherwise noted).—Jalisco: ½ mi. NW Mazamitla (Hooper, 1955: 11). Michoacán: 10 mi. NW Ciudad Hidalgo, Cerro San Andrés, 9400 ft.; 10 mi. ESE Zitácuaro, Macho de Agua, 8000 ft.; 9 mi. SE Pátzcuaro. Jalisco: 20 mi. SSE Autlán, 6500 ft. (Hooper, 1955:11); Sierra de Autlán.

Reithrodontomys sumichrasti sumichrasti (Saussure)

1861. *Reithrodon sumichrasti* Saussure, Revue et Mag. Zool., Paris, ser. 2, 13:3, type from México (restricted to Mirador, Veracruz, by Hooper (*infra,* p. 72).
1952. *Reithrodontomys sumichrasti sumichrasti,* Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:71, January 16.
1897. *Reithrodontomys rufescens* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:199, June 16, type from Jalapa, 4400 ft., Veracruz.

MARGINAL RECORDS (Hooper, 1952a:73–74, unless otherwise noted).—Querétaro: Amoles, somewhere between 7500 and 9500 ft. Hidalgo: Molango, 5400 ft. Veracruz: vicinity of Jalapa, 4500 ft. Oaxaca: Reyes, somewhere between 6700 and 10,200 ft.; 5 mi. NE Cerro San Felipe, La Cumbre, 9000 ft.; mountains 15 mi. SW Oaxaca, somewhere between 8800 and 9500 ft. Puebla: Río Atlati, 8700 ft. Morelos: 1½ mi. SE Huitzilac (Davis and Russell, 1954: 74).

Reithrodontomys sumichrasti vulcanius Bangs

1902. *Reithrodontomys australis vulcanius* Bangs, Bull. Mus. Comp. Zool., 39:38, April, type from Volcán de Chiriquí, 10,300 ft., Chiriquí, Panamá. Known only from the type locality.
1952. *Reithrodontomys sumichrasti vulcanius,* Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:83, January 16.

fulvescens-group

Reithrodontomys fulvescens

Fulvous Harvest Mouse

External measurements: 134–200; 72–116; 16–22; 11–17. Upper parts finely grizzled or "streaked" in a salt-and-pepper effect, resulting from a mixture of reddish brown and black; underparts varying geographically from pale buff to whitish; tail long, from 10 to 50 per cent longer than head and body; blackish eye ring absent; lateral line present or absent. Skull with comparatively robust rostrum; premaxillary tongues broad; braincase elongate; frontals inflated in region of base of rostrum; zygomatic plate broader than mesopterygoid fossa; sphenopalatine vacuities oblong; length of incisive foramina only slightly more than breadth of rostrum.

This harvest mouse occupies several dissimilar habitats. In the southern parts of its geographic range it characteristically inhabits arid inland valleys where temperatures are high and the soil is sandy or rocky. Elsewhere it occurs in moist tropical forests of conifers or on grassy plains. In some places it is common in weedy patches and along fence rows. It is often found associated with mesquite and prickly pear cactus.

Breeding data are essentially the same as for *R. megalotis.*

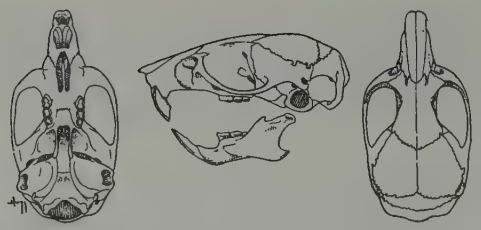


Fig. 334. *Reithrodontomys fulvescens intermedius*, Brownsville, Cameron Co., Texas, No. 1920 K.U., ♂, X 1½.

Reithrodontomys fulvescens amoenus (Elliot)

1905. *Rhithrodontomys amoenus* Elliot, Proc. Biol. Soc. Washington, 18:234, December 9, type from Reforma, about 500 ft., Oaxaca. Known only from the type locality.
1952. *Reithrodontomys fulvescens amoenus*, Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:120, January 16.

Reithrodontomys fulvescens aurantius J. A. Allen

1895. *Reithrodontomys mexicanus aurantius* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:137, May 21, type from Lafayette, Lafayette Parish, Louisiana.
1914. *Reithrodontomys fulvescens aurantius*, A. H. Howell, N. Amer. Fauna, 36:48, June 5.
1899. *Reithrodontomys chrysotis* Elliot, Field Columb. Mus., Publ. 37, Zool. Ser., 1:281, May 15, type from Dougherty, Washita River, Murray Co., Oklahoma.

MARGINAL RECORDS (Hooper, 1952a:106, unless otherwise noted).—Kansas: 1½ mi. SW Cedarvale (Cockrum, 1952:164). Missouri: 5 mi. N Gainesville. Arkansas: Beebe (A. H. Howell, 1914:49). Mississippi: Burnell. Louisiana: 12 mi. E Franklinton. Texas: Eagle Lake; 4 mi. NE San Marcos, 600 ft. Oklahoma: Dougherty, 750 ft.; Noble, 1500 ft.

Reithrodontomys fulvescens canus Benson

1939. *Reithrodontomys fulvescens canus* Benson, Proc. Biol. Soc. Washington, 52:149, October 11, type from 5 mi. SE Chihuahua, Chihuahua.

MARGINAL RECORDS (Hooper, 1952a:98, unless otherwise noted).—Texas: Limpia Canyon, 4300 ft., Davis Mts., 15 mi. N Fort Davis. Coahuila: Sierra del Carmen; 17 mi. N, 8 mi. W Saltillo, 5200 ft. (Baker, 1956:251). Durango: San Juan, 3800 ft., 12 mi. W Gómez Palacio; Indé, 6100 ft. Chihuahua: Casas Grandes, 4800 ft.

Reithrodontomys fulvescens chiapensis A. H. Howell

1914. *Reithrodontomys fulvescens chiapensis* A. H. Howell, N. Amer. Fauna, 36:53, June 5, type from Canjob, about 5000 ft., Chiapas.

MARGINAL RECORDS (Hooper, 1952a:122).—Chiapas: near Bochil, 4300 ft. Guatemala: 4⅛ mi. W Sacapulas, 4300 ft.; 6 mi. NNE Salamá, 5500 ft. Honduras: La Flor Archaga, 4500–5000 ft. El Salvador: Volcán San Miguel, 4300 ft. Chiapas: Cintalapa, 1800 ft.; Jaltenango, 2300 ft.

Reithrodontomys fulvescens difficilis Merriam

1901. *Reithrodontomys difficilis* Merriam, Proc. Washington Acad. Sci., 3:566, November 29, type from Orizaba, about 4500 ft., Veracruz.
1914. *Reithrodontomys fulvescens difficilis*, A. H. Howell, N. Amer. Fauna, 36:50, June 5.

MARGINAL RECORDS (Hooper, 1952a:111).—Hidalgo: San Agustín, 3500 ft. Puebla: Pahuatlán, 4500 ft. Veracruz: *4 mi. SE Jalapa, 4800 ft.*; 9 mi. ENE Tlacotepec, 1500 ft.; *Potrero Viejo, 1700 ft.*; Río Blanco, 4200 ft.

Reithrodontomys fulvescens fulvescens J. A. Allen

1894. *Reithrodontomys mexicanus fulvescens* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:319, November 7, type from Oposura, 2000 ft., Sonora.
1895. *Reithrodontomys fulvescens* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:138, May 21.

MARGINAL RECORDS (Hooper, 1952a:96, unless otherwise noted).—Arizona: Phoenix (Burt, 1933:119); mouth of Miller Canyon, 5300 ft., Huachuca Mts. Sonora: type locality; La Estancia, 2150 ft., 6 mi. N Nacori; La Misión, 2900 ft., 2 mi. SW Magdalena. Arizona: 8 mi. SW Tucson, 2400 ft.

Reithrodontomys fulvescens griseoflavus Merriam

1901. *Reithrodontomys griseoflavus* Merriam, Proc. Washington Acad. Sci., 3:553, November 29, type from Ameca, 4000 ft., Jalisco.
1952. *Reithrodontomys fulvescens griseoflavus*, Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:98, January 16.

MARGINAL RECORDS (Hooper, 1952a:100–101, unless otherwise noted).—Durango: Durango, 6200 ft. Tamaulipas: Jaumave, 2700–3300 ft. San Luis Potosí: Río Verde, 3200 ft. Michoacán: vicinity of Zamora, 5500–6000 ft. Jalisco: ½ mi. NW Mazamitla (Hooper, 1955:11); 6 mi. SSW Autlán, 4500 ft.; Talpa, 4000 ft. Nayarit: 2–4 mi. N Santa Isabel, 3800 ft. Aguascalientes: ½ mi. W Rincón de Romos (Hooper, 1955:11).

Reithrodontomys fulvescens helvolus Merriam

1901. *Reithrodontomys griseoflavus helvolus* Merriam, Proc. Washington Acad. Sci., 3:554, November 29, type from Oaxaca City, about 5000 ft., Oaxaca.
1914. *Reithrodontomys fulvescens helvolus*, A. H. Howell, N. Amer. Fauna, 36:52, June 5.

MARGINAL RECORDS (Hooper, 1952a:120).—Oaxaca: Huajuapan, 5000 ft.; 6 mi. SE Totolapan, 4000 ft. ?; Nejapa, 1900 ft.; Sola de la Vega, 5000 ft. Guerrero: Tlapa, 3000 ft.

Reithrodontomys fulvescens infernatis Hooper

1950. *Reithrodontomys fulvescens infernatis* Hooper, Proc. Biol. Soc. Washington, 63:167, December 29, type from Teotitlán, 3100 ft., Oaxaca.

MARGINAL RECORDS.—Puebla: Tepanco, 6000 ft. (Hooper, 1952a:119). Oaxaca: type locality.

Map 346. *Reithrodontomys fulvescens.*

1. *R. f. amoenus*
2. *R. f. aurantius*
3. *R. f. canus*
4. *R. f. chiapensis*
5. *R. f. difficilis*
6. *R. f. fulvescens*
7. *R. f. griseoflavus*
8. *R. f. helvolus*
9. *R. f. infernatus*
10. *R. f. intermedius*
11. *R. f. laceyi*
12. *R. f. mustelinus*
13. *R. f. nelsoni*
14. *R. f. tenuis*
15. *R. f. toltecus*
16. *R. f. tropicalis*

Reithrodontomys fulvescens intermedius J. A. Allen

1895. *Reithrodontomys mexicanus intermedius* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:136, May 21, type from Brownsville, Cameron Co., Texas.

1914. *Reithrodontomys fulvescens intermedius,* A. H. Howell, N. Amer. Fauna, 36:47, June 5.

MARGINAL RECORDS (Hooper, 1952a:108, unless otherwise noted).—Texas: 14 mi. WSW Hallettsville; 6 mi. NE Rockport (Blair, 1952:241), thence southward along coast and coastal islands to Tamaulipas: Hda. Santa Engracia, 800 ft. Coahuila: 2 mi. N San Lazaro, 64 mi. N, 22 mi. W Saltillo (Baker, 1956:252); 3 mi. NNW Cuatro Ciénagas (*ibid.*); 6 mi. SW San Gerónimo (*ibid.*).

Reithrodontomys fulvescens laceyi J. A. Allen

1896. *Reithrodontomys laceyi* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 8:235, November 21, type from Watsons Ranch, 15 mi. S San Antonio, Bexar Co., Texas.

1953. *Reithrodontomys fulvescens laceyi,* Russell, Texas Jour. Sci., 5:457, December.

MARGINAL RECORDS (Russell, 1953:457–458, unless otherwise noted).—Oklahoma: 8 mi. NW Indiahoma (McMurray, 1945:94, as *R. f. intermedius*); Mount Scott. Texas: 7 mi. N Gainesville; 6 mi. SW Walnut Springs; type locality; 20 mi. W Mountain Home (Hooper, 1952a: 108, as *R. f. intermedius*).

Reithrodontomys fulvescens mustelinus A. H. Howell

1914. *Reithrodontomys fulvescens mustelinus* A. H. Howell, N. Amer. Fauna, 36:54, June 5, type from Llano Grande, 300 ft., Oaxaca.

MARGINAL RECORDS (Hooper, 1952a:117, unless otherwise noted).—Michoacán: 1¾–6 mi. S Tacámbaro, 4000–5700 ft. Morelos: 1 mi. W Tepoztlán, 6000 ft. Guerrero: vicinity Chilpancingo, 4300–4500 ft. Oaxaca: type locality. Guerrero: Acapulco, near sea level. Michoacán: Coalcomán (Hooper, 1955:11).

Reithrodontomys fulvescens nelsoni A. H. Howell

1914. *Reithrodontomys fulvescens nelsoni* A. H. Howell, N. Amer. Fauna, 36:53, June 5, type from Colima, Colima.

MARGINAL RECORDS (Hooper, 1952a:114).—Jalisco: San Sebastián; 2 mi. N La Resolana, 1200 ft. Colima: type locality, thence northward along coast to the point of beginning.

Reithrodontomys fulvescens tenuis J. A. Allen

1899. *Reithrodontomys tenuis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 12:15, March 4, type from Rosario, Sinaloa.
1914. *Reithrodontomys fulvescens tenuis,* A. H. Howell, N. Amer. Fauna, 36:45, June 5.

MARGINAL RECORDS (Hooper, 1952a:113).—Sonora: vicinity Alamos, in range 1500–4500 ft. Chihuahua: Las Guásimas, near Batopilas, 2800 ft. Durango: Chacala, 1800 ft. Nayarit: Tepic, 3000 ft., thence northward along coast to point of beginning.

Reithrodontomys fulvescens toltecus Merriam

1901. *Reithrodontomys levipes toltecus* Merriam, Proc. Washington Acad. Sci., 3:555, November 29, type from Tlalpan, Distrito Federal, México.
1914. *Reithrodontomys fulvescens toltecus,* A. H. Howell, N. Amer. Fauna, 36:51, June 5.
1903. *Reithrodontomys inexspectatus* Elliot, Field Columb. Mus., Publ. 71, Zool. Ser., 3(8):145, March 20, type from Pátzcuaro, Michoacán.

MARGINAL RECORDS (Hooper, 1952a:104–105, unless otherwise noted).—Hidalgo: Zimapán, 6000–6400 ft. México: Hda. Córdoba, 8300 ft.; 4 km. ENE Tlalmanalco, 2290 m. (Villa, 1952:414). *Distrito Federal: 5 km. S Mexico City* (Goodwin, 1954:11). Michoacán: 4 mi. S Cuitzeo, 5900–6000 ft.; Los Reyes, 5000 ft. Guanajuato: Acámbaro, 6100 ft. Querétaro: Tequisquiapam, 6200 ft.

Reithrodontomys fulvescens tropicalis Davis

1944. *Reithrodontomys fulvescens tropicalis* Davis, Jour. Mamm., 25:393, December 12, type from Boca del Río, 8 km. S city of Veracruz, Veracruz.

MARGINAL RECORDS (Hooper, 1952a:110, unless otherwise noted).—Tamaulipas: vicinity Acuña, 1600–3600 ft., Sierra de Tamaulipas, thence southward along coast to Veracruz: Catemaco, 1100 ft.; Presidio; 4 mi. NNW Cerro Gordo, 1500 ft. Querétaro: Jalpán, 2500 ft. San Luis Potosí: 10 mi. E, 2 mi. N Ciudad del Maíz (Dalquest, 1953b:131). Tamaulipas: 5 mi. N Gómez Farías, 1100 ft.

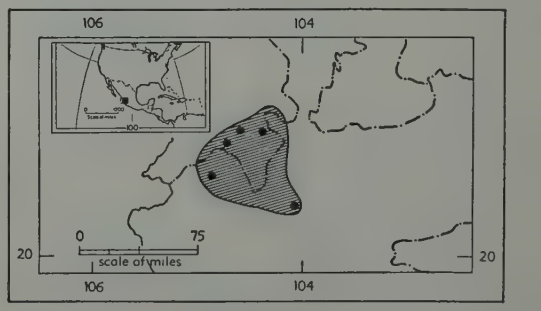
Reithrodontomys hirsutus Merriam
Hairy Harvest Mouse

1901. *Reithrodontomys hirsutus* Merriam, Proc. Washington Acad. Sci., 3:553, November 29, type from Ameca, 4000 ft., Jalisco.
1901. *Reithrodontomys levipes* Merriam, Proc. Washington Acad. Sci., 3:554, November 29, type from San Sebastián, 3000 ft., Jalisco.

External measurements: 175–202; 100–115; 20–22; 16–17. "In coloration [*hirsutus*] resembles pale races of *R. fulvescens* and *R. gracilis.* The peculiar 'streaked' appearance of the upper parts that is so characteristic of those species is accented even more in *hirsutus.* The monocolor or faintly bicolor tail and slightly dusky hind feet are essentially matched in species of *Aporodon* and are seen in some specimens of *sumichrasti* and *chrysopsis.* . . . . It is distinguishable from all species of the genus except *fulvescens* in characters of M3. In that tooth there are 2 long enamel folds, the major and the first primary. They are about equal in length" (Hooper, 1952:123).

MARGINAL RECORDS (Hooper, 1952a:127).—Nayarit: 2–4 mi. N Santa Isabel, 3800 ft.; 1 mi. E Ixtlán del Río, 4000 ft. Jalisco: type locality; San Sebastián, 4000 ft. Nayarit: 1 mi. SW San José del Conde, 3000 ft.

Fig. 335. *Reithrodontomys hirsutus,* 4 mi. N Santa Isabel, Nayarit, No. 94314 Mich., ♂, X 1¾.



Map 347. *Reithrodontomys hirsutus.*

Subgenus **Aporodon** A. H. Howell

1914. *Aporodon* A. H. Howell, N. Amer. Fauna, 36:63, June 5. Type, *Reithrodontomys tenuirostris* Merriam.

Certain differences from subgenus *Reithrodontomys* are as follows: That part of skull posterior to least interorbital constriction longer than anterior part; braincase elongate, large, greatly inflated, extending laterally beyond anterolateral limits of zygomatic arches; zygomatic plate narrower than mesopterygoid fossa; pterygoid hamulae well inflated, reflexed laterad, club-shaped from ventral aspect.

mexicanus-group

Reithrodontomys gracilis

Slender Harvest Mouse

External measurements: 152–191; 75–113; 15–20; approximately 14. Upper parts pale and with same "streaked" or "peppered" effect found in *fulvescens* and *hirsutus*; underparts varying from white to bright orange-cinnamon; lateral line sometimes present. Skull comparatively flat; zygomatic arches widespread and parallel, or almost so; frontals exceptionally broad and flat interorbitally; braincase broad, shallow, long; palate long; rostrum and incisive foramina short; molars with complete mesolophs.

This species inhabits the dry inland valleys of southern México and Central America, usually at altitudes of less than 1000 feet.

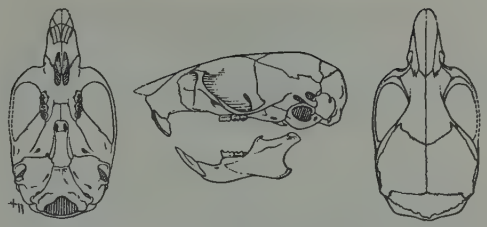
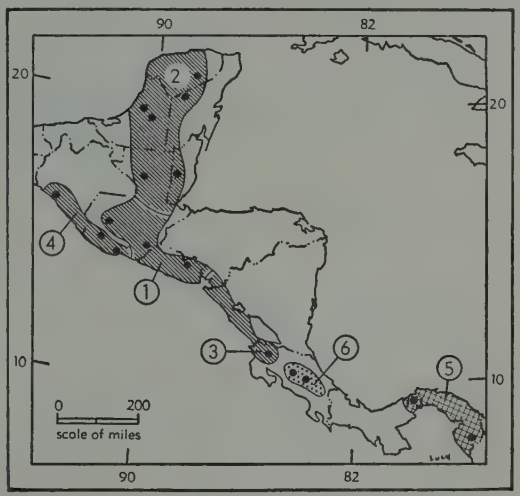


Fig. 336. *Reithrodontomys gracilis gracilis*, Mt. Pine Ridge, 12 mi. S Cayo, British Honduras, No. 63072 Mich., ♂, X 1½.



Map 348. Three species of *Reithrodontomys*.

1. *R. gracilis anthonyi*
2. *R. gracilis gracilis*
3. *R. gracilis harrisi*
4. *R. gracilis pacificus*
5. *R. darienensis*
6. *R. brevirostris*

Reithrodontomys gracilis anthonyi Goodwin

1932. *Reithrodontomys gracilis anthonyi* Goodwin, Amer. Mus. Novit., 560:3, September 16, type from Sacapulas, 4500 ft., El Quiché, Guatemala.

MARGINAL RECORDS (Hooper, 1952a:135).—Guatemala: type locality; Lago Atescatempo, 2500 ft. El Salvador: Monte Cristo Mine, 700 ft.

Reithrodontomys gracilis gracilis J. A. Allen and Chapman

1897. *Reithrodontomys mexicanus gracilis* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:9, February 23, type from Chichén-Itzá, Yucatán.
1914. *Reithrodontomys gracilis*, A. H. Howell, N. Amer. Fauna, 36:76, June 5.

MARGINAL RECORDS (Hooper, 1952a:133, unless otherwise noted).—Yucatán: type locality. Quintana Roo: Santa Rosa. British Honduras: Mountain Pine Ridge, 1000 ft., 12 mi. S Cayo. Guatemala: La Libertad (Goodwin, 1955d:4). Campeche: Apazote, 300 ft.; San Juan, 50 mi. S Campeche, 100 ft.

Reithrodontomys gracilis harrisi Goodwin

1945. *Reithrodontomys harrisi* Goodwin, Amer. Mus. Novit., 1293:2, July 20, type from Hacienda Santa María, 3200 ft., 18 mi. NE Liberia, Guanacaste, Costa Rica. Known only from the type locality.
1952. *Reithrodontomys gracilis harrisi*, Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:136, January 16.

Reithrodontomys gracilis pacificus Goodwin

1932. *Reithrodontomys pacificus* Goodwin, Amer. Mus. Novit., 560:2, September 16, type from Hacienda California, 6 mi. from Ocós, Guatemala.
1952. *Reithrodontomys gracilis pacificus*, Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:135, January 16.

MARGINAL RECORDS (Hooper, 1952a:136).—Chiapas: Pijijiapan, 50 ft. Guatemala: Finca El Ciprés, 2000 ft.; San José, 15 ft.

Reithrodontomys darienensis Pearson
Darién Harvest Mouse

1939. *Reithrodontomys darienensis* Pearson, Not. Naturae, Acad. Nat. Sci. Philadelphia, 6:1, June 8, type from [Santa Cruz de] Cana, 2000 ft., upper Río Tuyra, Darién, Panamá.

External measurements: 162–177; 100–112; 17–19; 14–15. Color as in *R. gracilis*. Selected features in which *R. darienensis* differs from *R. gracilis* are: tail actually and relatively longer (more than 148 per cent of head–body length as opposed to 131 in *R. gracilis*); braincase relatively shorter, and oval rather than obovoid; rostrum relatively shorter (82 per cent of depth of rostrum as opposed to 90 per cent); zygomatic plate narrower (16 per cent of cranial depth as opposed to 21 per cent); auditory bullae relatively smaller (*fide* Hooper, 1952:137).

MARGINAL RECORDS.—Panamá: Gatún (possibly of this species according to Hooper, 1952a:137); type locality.

Reithrodontomys mexicanus
Mexican Harvest Mouse

External measurements: 160–203; 92–126; 17–21; 14.5–18. Upper parts approximately tawny or orange-cinnamon, but varying in precise tone according to subspecies; underparts varying from whitish to pale cinnamon or orange-cinnamon; tail unicolor, blackish or dark brown, or rarely paler below or white-tipped. Skull with broad braincase; zygomatic arch weak anteriorly; rostrum broad; palate usually approximately as broad as molar tooth-row, shorter than incisive foramina; molars comparatively large.

According to Hooper (1952a:139) this species is usually associated with humid oak-pine and tropical broadleaf forests but does occur in rain forest and semiarid deciduous forests. *R. mexicanus* seems to be dependent upon grasses, herbs, and low shrubs. There are 2 to 5 young in a litter.

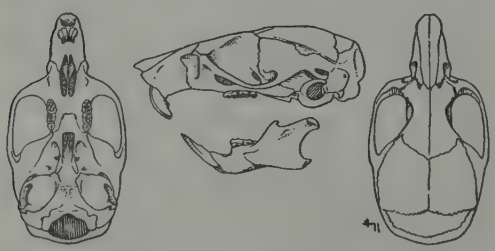


Fig. 337. *Reithrodontomys mexicanus cherrii*, 3 km. S Cartago, Prov. Cartago, Costa Rica, No. 26973 K.U., ♀, X 1½.

Reithrodontomys mexicanus cherrii (J. A. Allen)

1891. *Hesperomys* (*Vesperimus*) *cherrii* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:211, April 17, type from San José, Costa Rica.
1914. *Reithrodontomys mexicanus cherrii*, A. H. Howell, N. Amer. Fauna, 36:73, June 5.
1895. *Reithrodontomys costaricensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:139, May 21, type from La Carpintera, 5000 ft., Costa Rica.

MARGINAL RECORDS (Hooper, 1952a:154).—Costa Rica: Tapesco, 5000 ft.; slopes of Volcán de Irazú; El Copey de Dota, 6000–6500 ft.; vicinity Alajuela, 3200–3500 ft.

Reithrodontomys mexicanus garichensis Enders and Pearson

1940. *Reithrodontomys mexicanus garichensis* Enders and Pearson, Not. Naturae, Acad. Nat. Sci. Philadelphia, 60:1, October 8, type from Río Gariché, 5 mi. SW El Volcán Post Office, 3200 ft., Chiriquí, Panamá.

MARGINAL RECORDS (Hooper, 1952a:158).—Panamá: Cerro Pando; Boquete, 3500–4000 ft.; near Boquerón.

Reithrodontomys mexicanus howelli Goodwin

1932. *Reithrodontomys mexicanus howelli* Goodwin, Amer. Mus. Novit., 560:1, September 16, type from Chichicastenango, 6500 ft. (Santo Thomás), El Quiché, Guatemala.

MARGINAL RECORDS (Hooper, 1947:147).—Chiapas: Tumbalá, 4000 ft. Guatemala: Santa Clara, Sierra de las Miñas, 5500 ft.; Jacaltenango, 4600 ft. Chiapas: Prusia, 3500–4500 ft.; Bochil, 4300 ft.

Reithrodontomys mexicanus lucifrons A. H. Howell

1932. *Reithrodontomys mexicanus lucifrons* A. H. Howell, Proc. Biol. Soc. Washington, 45:125, July 30, type from Cerro Cantoral (about 15 mi. (air-line) NNW Tegucigalpa), 6000 ft., Honduras.
1932. *Reithrodontomys mexicanus minusculus* A. H. Howell, Proc. Biol. Soc. Washington, 45:125, July 30, type from Comayaguela, 3000 ft., Honduras.

MARGINAL RECORDS (Hooper, 1952a:152).—Honduras: Hatillo, 4800 ft. Nicaragua: Río Coco. Honduras: Sabana Grande, 3500 ft.; Humuya (= Muya, 4000 ft. ?).

Reithrodontomys mexicanus mexicanus (Saussure)

1860. *R*[*eithrodon*]. *mexicanus* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:109, type from mountains of Veracruz; restricted to Mirador, Veracruz, by Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 77:140, January 16.
1914. *Reithrodontomys mexicanus mexicanus*, A. H. Howell, N. Amer. Fauna, 36:70, June 5. Not *Reithrodontomys mexicanus* (Saussure), being instead of J. A. Allen, 1895: 135, which in part equalled *Reithrodontomys fulvescens difficilis*.
1901. *Reithrodontomys costaricensis jalapae* Merriam, Proc. Washington Acad. Sci., 3:552, November 29, type from Jalapa, 4000 ft., Veracruz.

Map 349. *Reithrodontomys mexicanus.*

Guide to subspecies
1. *R. m. cherrii*
2. *R. m. garichensis*
3. *R. m. howelli*
4. *R. m. lucifrons*
5. *R. m. mexicanus*
6. *R. m. ocotepequensis*
7. *R. m. orinus*
8. *R. m. potrerograndei*
9. *R. m. riparius*
10. *R. m. scansor*

1901. *Reithrodontomys goldmani* Merriam, Proc. Washington Acad. Sci., 3:552, November 29, type from Metlaltoyuca, 800 ft., Puebla.

MARGINAL RECORDS (Hooper, 1952a:144, unless otherwise noted).—Tamaulipas: Rancho del Cielo, 3500 ft. Puebla: Metlaltoyuca, 800 ft. Veracruz: Tlapacoyán, 1700 ft.; Altotonca [*sic*], 6000 ft. Oaxaca: Totontepec, 6000 ft. Puebla: Huauchinango, 4900 ft. Hidalgo: Molango, 5200 ft. San Luis Potosí (Dalquest, 1953b:133): above Xilitla at Miramar Grande, 5000 ft.; 10 km. E Platanito.

Reithrodontomys mexicanus ocotepequensis Goodwin

1937. *Reithrodontomys mexicanus ocotepequensis* Goodwin, Amer. Mus. Novit., 921:1, May 3, type from Monte Verde, 4500 ft., 30 mi. NE Ocotepeque, Ocotepeque, Honduras.

MARGINAL RECORDS (Hooper, 1952a:150).—Honduras: Monte Linderos, 5700 ft.; type locality. El Salvador: Los Esesmiles, 7500–8000 ft.

Reithrodontomys mexicanus orinus Hooper

1949. *Reithrodontomys mexicanus orinus* Hooper, Proc. Biol. Soc. Washington, 62:169, November 16, type from Hacienda Chilata, 2000 ft., about 12 mi. SE Sonsonate, Sonsonate, El Salvador.

MARGINAL RECORDS (Hooper, 1952a:149).—Guatemala: Finca San Rafael, 7000 ft. El Salvador: Los Esesmiles, 6400 ft.; Cerro Cacaguatique, 3500–3750 ft.; Volcán de Santa Ana, 4500–5000 ft.

Reithrodontomys mexicanus potrerograndei Goodwin

1945. *Reithrodontomys mexicanus potrerograndei* Goodwin, Amer. Mus. Novit., 1293:1, July 20, type from Agua Buena (locally known as Cañas Gordas, but approximately 30 air-line miles N Cañas Gordas near Panamanian boundary), 3500 ft., Sabana de Potrero Grande, Puntarenas, Costa Rica.

MARGINAL RECORDS.—Costa Rica: type locality. Panamá: Río Chiriquí Viejo, Wald, 3800 ft. (Hooper, 1952a:155).

Reithrodontomys mexicanus riparius Hooper

1955. *Reithrodontomys mexicanus riparius* Hooper, Occas. Papers Mus. Zool., Univ. Michigan, 565:12, March 1, type from 2½ mi. SW Coalcomán, 3600 ft., Michoacán. Known only from the type locality.

Reithrodontomys mexicanus scansor Hooper

1950. *Reithrodontomys mexicanus scansor* Hooper, Jour. Washington Acad. Sci., 40:418, December 15, type from Villa Flores, 2000 ft., Chiapas.

MARGINAL RECORDS.—Chiapas: Cintalapa, 1700 ft. (Hooper, 1952a:145); type locality.

Reithrodontomys brevirostris Goodwin
Short-nosed Harvest Mouse

1943. *Reithrodontomys brevirostris* Goodwin, Amer. Mus. Novit., 1231:1, June 2, type from canyons above Villa Quesada, 5000 ft., Alajuela, Costa Rica.

External measurements: 182–203; 106–113; 17–20; approximately 14. Upper parts bright ochraceous-tawny much darkened, especially middorsally, by suffusion of black; underparts white, sharply delimited from upper parts; feet dull white with brown stripe extending to base of toes; tail unicolor, fuscous. Skull closely resembling that of *R. mexicanus cherrii* but smaller; braincase shallow and flattened; rostrum short; anterior part of frontals depressed and forming shallow sulcus at posterior border of nasals; zygomatic arches robust, parallel-sided; palate narrow; molar teeth small.

This species is known only from within the limits of the rain forest in the Cordillera Central of Costa Rica.

MARGINAL RECORDS.—Costa Rica: type locality; Estrella de Cartago, 6000 ft. ? (Hooper, 1952a:165).

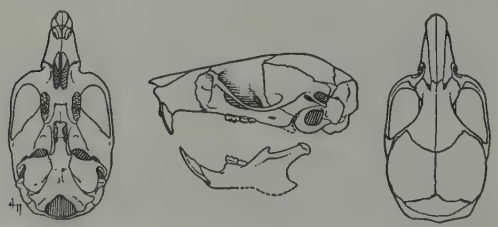


Fig. 338. *Reithrodontomys brevirostris*, Laja Villa Quesada, 8 mi. off main road, San Carlos, Costa Rica, No. 139730 A.M., ♀, X 1½.

tenuirostris-group
Reithrodontomys microdon
Small-toothed Harvest Mouse

External measurements: 169–187; 101–117; 19–21; 16–17. Upper parts dark reddish brown; underparts vary from white to bright orange-cinnamon; eye ring blackish; hind feet blackish, sometimes rimmed with white; tail unicolor, blackish. Skull long, deep, broad; zygomata comparatively weak, markedly convergent anteriorly; incisors comparatively erect; incisive foramina long with reference to palatal length; auditory bullae moderately inflated.

The *tenuirostris*-group is the most specialized of the genus and the few specimens are all from cool, moist tropical forests. These mice probably are among the most arboreal of the harvest mice, which may account in some degree for their scarcity in collections.

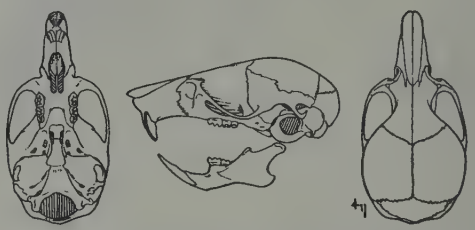
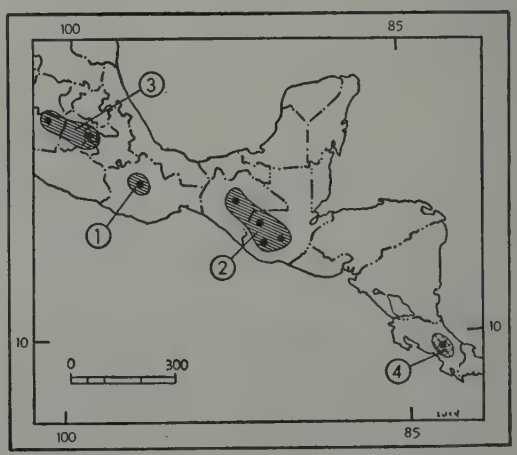


Fig. 339. *Reithrodontomys microdon microdon*, Todos Santos, Huehuetenango, Guatemala, No. 76922 U.S.N.M., ♂, X 1½.



Map 350. Two species of *Reithrodontomys*.

1. *R. microdon albilabris*
2. *R. microdon microdon*
3. *R. microdon wagneri*
4. *R. rodriguezi*

Reithrodontomys microdon albilabris Merriam

1901. *Reithrodontomys microdon albilabris* Merriam, Proc. Washington Acad. Sci., 3:549, November 29, type from Cerro San Felipe, 10,000 ft., Oaxaca. Known only from the type locality.

Reithrodontomys microdon microdon Merriam

1901. *Reithrodontomys microdon* Merriam, Proc. Washington Acad. Sci., 3:548, November 29, type from Todos Santos, 10,000 ft., Guatemala.

MARGINAL RECORDS (Hooper, 1952a:171).—Chiapas: 6 mi. SE San Cristóbal, 7300 ft. Guatemala: Chemal, 10,500 ft.; Chichavac, 8800 ft., near Tecpán; Volcán Santa María.

Reithrodontomys microdon wagneri Hooper

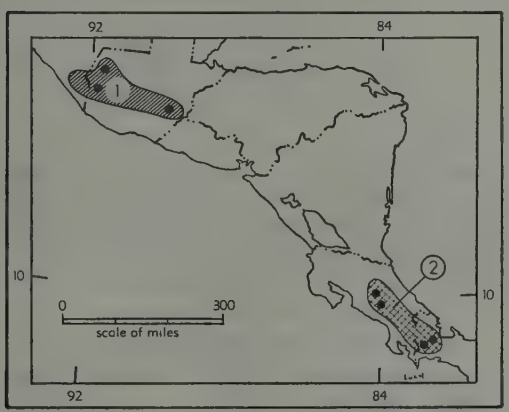
1950. *Reithrodontomys microdon wagneri* Hooper, Proc. Biol. Soc. Washington, 63:169, December 29, type from western flanks of Cerro San Andrés, 9400 ft., about 10 mi. NW of C. Hidalgo, Michoacán.

MARGINAL RECORDS.—Michoacán: type locality. Distrito Federal: Cañón Contreras, 15 mi. SW Mexico City, 9300–10,000 ft. (Hooper, 1952a:170).

Reithrodontomys tenuirostris Merriam
Narrow-nosed Harvest Mouse

1901. *Reithrodontomys tenuirostris* Merriam, Proc. Washington Acad. Sci., 3:547, November 29, type from Todos Santos, 10,000 ft., Guatemala.

1901. *Reithrodontomys tenuirostris aureus* Merriam, Proc. Washington Acad. Sci., 3:548, November 29, type from Calel, SW of Momostenango, 10,200 ft., Quezaltenango, Guatemala.



Map 351. Two species of *Reithrodontomys*.
1. *R. tenuirostris* 2. *R. creper*

External measurements of 3 specimens are: 200–231; 120–129; 23; 15–17. Upper parts tawny or cinnamon-orange heavily interspersed with long, black hairs; underparts pinkish-cinnamon, not sharply demarked from color of upper parts; eye ring and ears black; tail unicolor blackish brown, well haired. Braincase broad, deep; rostrum and incisive foramina long. Pelage long (approximately 10 mm. middorsally) and lax.

MARGINAL RECORDS (Hooper, 1952a:174).—Guatemala: type locality; Cerro near Mataquescuintla, 8400 ft.; Volcán de Tajumulco, 8000–10,400 ft. See Map 351.

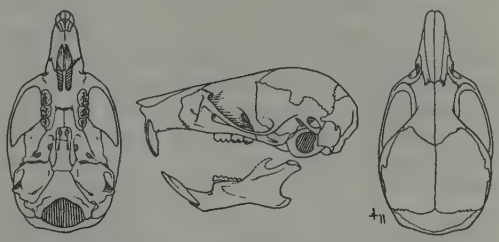


Fig. 340. *Reithrodontomys tenuirostris*, Todos Santos, Huehuetenango, Guatemala, No. 76996 U.S.N.M., ♀, X 1½.

Reithrodontomys rodriguezi Goodwin
Rodriguez's Harvest Mouse

1943. *Reithrodontomys rodriguezi* Goodwin, Amer. Mus. Novit., 1231:1, June 2, type from Volcán de Irazú, 9400 ft., Cartago, Costa Rica. Known only from the type locality. See Map 350.

This species is known by only 2 specimens, both of them subadults. Therefore adequate description is not yet possible. The known specimens may be characterized as follows: external measurements: 193, 204; 116, 121; 20, 21; 14, 15. Pelage long, dense, soft. Upper parts cinnamon-buff darkened with long black hairs; underparts white; eye ring dusky; tail unicolor, dark brown except for white tip; feet white with dusky line extending to base of toes. Skull as in other species of *tenuirostris*-group; braincase large; rostrum long (length approximately 93 per cent of cranial depth).

The specimens were obtained near the edge of a rain forest.

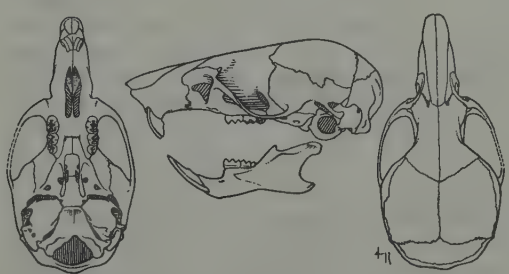


Fig. 341. *Reithrodontomys creper*, Irazú, 9400 ft., Costa Rica, No. 14120 A.M., ♂, X 1½.

Reithrodontomys creper Bangs
Chiriquí Harvest Mouse

1902. *Reithrodontomys creper* Bangs, Bull. Mus. Comp. Zool., 39:39, April, type from Volcán de Chiriquí, 11,000 ft., Chiriquí, Panamá.

External measurements: 208–238; 119–145; 22–25; 13–17. Color essentially like that of *R. tenuirostris* but darker and with paler tail. Skull larger in all dimensions than in *R. tenuirostris* but rostrum more robust and much longer (length usually exceeding cranial depth in *creper* but not in *tenuirostris*); frontals broad interorbitally (44–47 per cent of cranial depth in *creper*; 40–42 in *tenuirostris*).

MARGINAL RECORDS (Hooper, 1952a:176).—Costa Rica: El Volcán de Irazú, 9400 ft. Panamá: Casita Alta, 7500 ft.; crater of El Volcán, 11,000 ft. Costa Rica: Cerro de la Muerta, 11,000 ft. See Map 351.

Genus Peromyscus Gloger—White-footed Mice

1841. *Peromyscus* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, 1:95. Type, *Peromyscus arboreus* Gloger [= *Mus sylvaticus noveboracensis* Fischer].

External measurements: 121–376; 40–205; 15–38. Form murine; tail at least one-third total length; tail with squamous annulations at least partly hidden by hairs; tail often distinctly penicillate; pelage usually soft and full; ears relatively large (as compared with, say, the microtine rodents), finely clothed with hairs; hind feet 5- or 6-tuberculed. Skull relatively little sculptured, thin-walled; interorbital constriction always apparent; supraorbital ridges poorly developed, sometimes beaded, sometimes slightly trenchant; rostrum slender and long (in the generic name *Peromyscus*, the initial *Pero* = pointed); interparietal well developed; zygomata delicate, depressed to level of palate; zygomatic plate narrow, approximately straight anteriorly; anterior palatine foramina long, slitlike, separated by a thin bony septum; no palatal pits present; coronoid process of mandible strongly reduced; molars small, brachydont, tuberculate; tubercles arranged in 2 longitudinal series, or in 4 longitudinal series with 2 of the series much reduced; upper molars 3-rooted, lowers 2-rooted; upper incisors lacking pronounced grooves; tympanic bullae situated obliquely to long axis of skull; bullae moderately inflated. Mammae 4 or 6.

The genus *Peromyscus* is one of the most widespread and geographically variable of North American rodents. Except in the northern parts of Arctic America, the deer mice are to be found in almost every possible habitat. Some species are found in low, arid deserts; others live in rain forests of the tropics. Still others occur on barren tundras of the north or above timberline on the mountains. Occasionally, deer mice are captured in wooden traps floating on still waters of small marshes. In most places within the geographic range of the genus these mice are the most abundant mammals.

Deer mice are clean and dainty; many species live well in the laboratory. This, coupled with the ease with which they can be fed and their high reproductive rate, makes them highly suitable for physiological and genetic studies. Their geographic distribution and amazing geographic variability make them desirable subjects of distributional, ecological, and variational studies. It is the large number of species and the geographic variation in most species, however, that make the identification of these mice difficult indeed.

Normally mice of this genus molt but once a year after adult pelage is attained. This annual molt usually begins along the sides and progresses upward. When the areas of new hairs meet middorsally, the molt progresses both anteriorly and posteriorly. Juvenal pelage is a characteristic plumbeous or "mouse" gray, and the color is almost uniform. There is a clearly defined postjuvenal molt before full adult pelage is attained, and in some species there is some evidence of an additional molt between the juvenal and postjuvenal molts (Hoffmeister, 1951:6).

The color and color pattern in the genus is variable. Some species are nearly white and others nearly black. Some are unicolor and some sharply bicolor. In most species the upper parts are conspicuously darker, and more richly colored, than the venter.

White-footed mice eat a wide variety of food; almost anything edible is accepted at least under some conditions. In turn, white-footed mice are one of the principal prey species in North America, and as such are a principal buffer species for valuable game and fur-bearers.

KEY TO SUBGENERA OF PEROMYSCUS
(adapted from Osgood, 1909:32)

1. Plantar tubercles 5. . . . . *Podomys*, p. 658
1′. Plantar tubercles 6.
    2. Two principal outer angles of M1 and M2 with more or less well developed accessory tubercles or enamel loops; mammae: pectoral, 1–1; inguinal, 2–2.
        3. Ears dusky or dusky edged with whitish, in slight contrast to color of head and body; posterior palatine foramina approximately midway between anterior palatine foramina and posterior edge of palate; dentine spaces of molars mostly confluent.

4. Total length generally less than 250; hind foot less than 32 (exceptions: *P. guatemalensis* and *P. zarhynchus*); outer accessory tubercles or loops of m1 and m2 only slightly developed. *Peromyscus*, p. 609
4′. Total length generally more than 250; hind foot more than 30; outer accessory tubercles or loops of m1 and m2 well developed. . *Megadontomys*, p. 655
3′. Ears bright ochraceous, same color as body; posterior palatine foramina nearer to posterior edge of palate than to anterior palatine foramina; dentine spaces of molars mostly closed. . *Ochrotomys*, p. 656
2′. Two principal outer angles of M1 and M2 simple; without, or at most with rudimentary, accessory cusps or enamel loops; mammae: pectoral, none; inguinal, 2–2. *Haplomylomys*, p. 601

Subgenus **Haplomylomys** Osgood

Revised by Osgood, N. Amer. Fauna, 28:228–252, April 17, 1909.

1904. *Haplomylomys* Osgood, Proc. Biol. Soc. Washington, 17:53, March 21. Type, *Hesperomys eremicus* Baird.

Tail always longer than head and body; plantar tubercles 6; mammae 4 (i. $\frac{2}{2}$, a. $\frac{0}{0}$, p. $\frac{0}{0}$); skull with cranium rather large and rostral region relatively weak; 1st and 2nd upper molars usually with 3 salient and 2 re-entrant outer angles at all stages of wear; accessory tubercles between outer primary tubercles rudimentary or absent; lower molars correspondingly simple (after Osgood, 1909:228).

KEY TO NOMINAL SPECIES OF SUBGENUS HAPLOMYLOMYS

1. Tail shorter than head and body; occurring on Tortuga Island, Gulf of California. . . . *P. dickeyi*, p. 608
1′. Tail not shorter than head and body; not occurring on Tortuga Island, Gulf of California.
2. Occurring on islands in Gulf of California.
3. Occurring on Tiburón, Carmen, San José, Espíritu Santo, and Ceralbo islands. . *P. eremicus*, p. 605
3′. Not occurring on Tiburón, Carmen, San José, Espíritu Santo, or Ceralbo islands; occurring as follows:
a. San Esteban Island. . . . . *P. stephani*, p. 609
b. Turners Island. . . . . *P. collatus*, p. 604
c. San Pedro Nolasco Island. . . . . *P. pembertoni*, p. 608
d. Coronados Island. . . . . *P. pseudocrinitus*, p. 604
e. Monserrate Island. . . . . *P. caniceps*, p. 608
f. Mejía, South Lorenzo, or Angel de la Guardia islands. . . . . *P. guardia*, p. 608
2′. Occurring on mainland or on islands off Pacific Coast of North America.
4. Total length more than 220; hind foot more than 25. . . . . *P. californicus*, p. 604
4′. Total length less than 220; hind foot less than 25.
5. Zygomatic arches compressed anteriorly; nasals attenuate; posterior tips of nasals and premaxillae approximately subequal. . . . . *P. crinitus*, p. 601
5′. Zygomatic arches widely flaring anteriorly; nasals broad, flat, much exceeded in posterior extension by premaxillae.
6. Braincase flattened; body form stout. . . . . *P. merriami*, p. 607
6′. Braincase rounded; body form slender. . . . . *P. eremicus*, p. 605

Peromyscus crinitus
Canyon Mouse

Revised by Hall and Hoffmeister, Jour. Mamm., 23:51–56, February 14, 1942.

External measurements: 161–192; 82–118; 17.5–23; 15.3–21.5. Upper parts mixed ochraceous and brown or black, hairs plumbeous basally; underparts usually much paler, sometimes white. Tail longer than head and body (except in occasional individuals), bicolored (except in *delgadilli*); ear approximately as long as hind foot; mammae, i., $\frac{2}{2}$. Skull with short tooth-row; width across anterior part of zygomatic arches less than greatest width of braincase; premaxillae not extending markedly posterior to nasals. M1 and M2 lack accessory cusps or folds except in occasional individuals.

Canyon mice are highly discontinuous in distribution because they are confined to rocky habitats. The nests are in crevices and clefts in rocks or, more commonly, in burrows under rocks. Altitudinally the species ranges from hot deserts below sea level up to cool heights more than 10,000 feet in elevation.

Most young are born in late spring or early summer. Three to 5 comprise a litter.

Fig. 342. *Peromyscus crinitus pergracilis*, 2 mi. W Smith Creek Cave, Nevada, No. 79179 M.V.Z., ♂, X 1½.

Peromyscus crinitus auripectus (J. A. Allen)

1893. *Sitomys auripectus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:75, April 28, type from Bluff City, San Juan Co., Utah.
1909. *Peromyscus crinitus auripectus*, Osgood, N. Amer. Fauna, 28:231, April 17.
1937. *Peromyscus crinitus peridoneus* Goldman, Jour. Mamm., 18:92, February 11, type from Bright Angel Trail, S side Grand Canyon, 4800 ft., Coconino Co., Arizona.

MARGINAL RECORDS (Hall and Hoffmeister, 1942: 65, unless otherwise noted).—Colorado: S bank Yampa River, 4 mi. NNW Cross Mtn. (Goin, 1944:191); 12 mi. above Glenwood Springs, 6000 ft.; Grand Junction; near Coventry, 6800 ft.; Mesa Verde. New Mexico: Chaco Canyon National Monument, 6400 ft. Arizona: Holbrook; 12 mi. N Deadman Flat, NE San Francisco Mtn.; Supai Canyon. Utah (Durrant, 1952:303–304): Rainbow Bridge, 4000 ft.; 1 mi. E Highway 160, 6 mi. S Valley City, 4500 ft.; mouth Florence Canyon, 35 mi. N Greenriver, 4306 ft.

Peromyscus crinitus crinitus (Merriam)

1891. *Hesperomys crinitus* Merriam, N. Amer. Fauna, 5:53, July 30, type from Shoshone Falls, N side Snake River, Jerome Co., Idaho.
1899. *Peromyscus crinitus*, Bangs, *infra.*
1899. *Peromyscus crinitus scitulus* Bangs, Proc. New England Zool. Club, 1:67, July 31, type from Gardnerville, Douglas Co., Nevada.

MARGINAL RECORDS (Hall and Hoffmeister, 1942: 57, unless otherwise noted).—Oregon: Maupin; 3 mi. NE Huntington, 2100 ft. Idaho: 3 mi. NE Hammett; type locality; Salmon Creek, 8 mi. W Rogerson. Nevada (Hall, 1946:506–508): 18 mi. NE Iron Point, 4600 ft.; 4 mi. N Hot Creek, Hot Creek Range; 7 mi. W Tybo, Hot Creek Range, 6700–7200 ft.; East Walker River, 2 mi. NW Morgans Ranch, 5050–5100 ft. California: 2 mi. NE Woodfords, 5600–5700 ft.; 1 mi. N Wendel; 5 mi. N Fredonyer Peak, 5700 ft.; Indian Well (Cave and Blue Grotto), Lava Beds National Monument.

Peromyscus crinitus delgadilli Benson

1940. *Peromyscus crinitus delgadilli* Benson, Proc. Biol. Soc. Washington, 53:1, February 16, type from 2 mi. S Cráter Elegante. 34 mi. W Sonoita, Sierra del Pinacate, Sonora.

MARGINAL RECORDS (Hall and Hoffmeister, 1942: 64).—Sonora: type locality; Río Sonoita, 30 mi. WSW Sonoita; type locality.

Peromyscus crinitus disparilis Goldman

1932. *Peromyscus crinitus disparilis* Goldman, Proc. Biol. Soc. Washington, 45:90, June 21, type from Tinajas Altas, 2000 ft., Gila Mts., Yuma Co., Arizona.
1940. *Peromyscus crinitus rupicolus* Benson, Proc. Biol. Soc. Washington, 53:2, February 16, type from Paso MacDougal, E end Sierra Hornaday, Sonora.
1940. *Peromyscus crinitus scopulorum* Benson, Proc. Biol. Soc. Washington, 53:2, February 16, type from Cerro La Cholla, 6 mi. WNW Punta Peñasca, Sonora.

MARGINAL RECORDS (Hall and Hoffmeister, 1942: 63).—Arizona: 10 mi. W Wellton; 5 mi. S Wellton; Tule Tank. Sonora: Cerro La Cholla, 6 mi. WNW Punta Peñasca, 50 ft. Arizona: 20 mi. S Wellton.

Peromyscus crinitus doutti Goin

1944. *Peromyscus crinitus doutti* Goin, Jour. Mamm., 25: 189, May 26, type from Antelope Canyon, 7200 ft., 20 mi. SE Duchesne, Duchesne Co., Utah.

MARGINAL RECORDS.—Wyoming: 1 mi. N Linwood, Utah (Goin, 1944:191). Utah (Durrant, 1952:302): Dinosaur Quarry, 6 mi. N Jensen, 5500 ft.; along Green River, 15 mi. SW (airline) Ouray, 4500 ft.; 21 mi. out of San Rafael; 8 mi. N Escalante; Sun View Forest Camp, Red Canyon, 3 mi. E Bicknell, 6900 ft.; Summit, E Sevier Co.; type locality.

Peromyscus crinitus pallidissimus Huey

1931. *Peromyscus crinitus pallidissimus* Huey, Trans. San Diego Soc. Nat. Hist., 6:389, August 28, type from small island in Gonzaga Bay, 29° 50′ N, 114° 20′ W, Baja California. Known only from the type locality.

Peromyscus crinitus pergracilis Goldman

1939. *Peromyscus crinitus pergracilis* Goldman, Jour. Mamm., 20:356, August 14, type from S end Stansbury Island, 4250 ft., Great Salt Lake, Tooele Co., Utah.

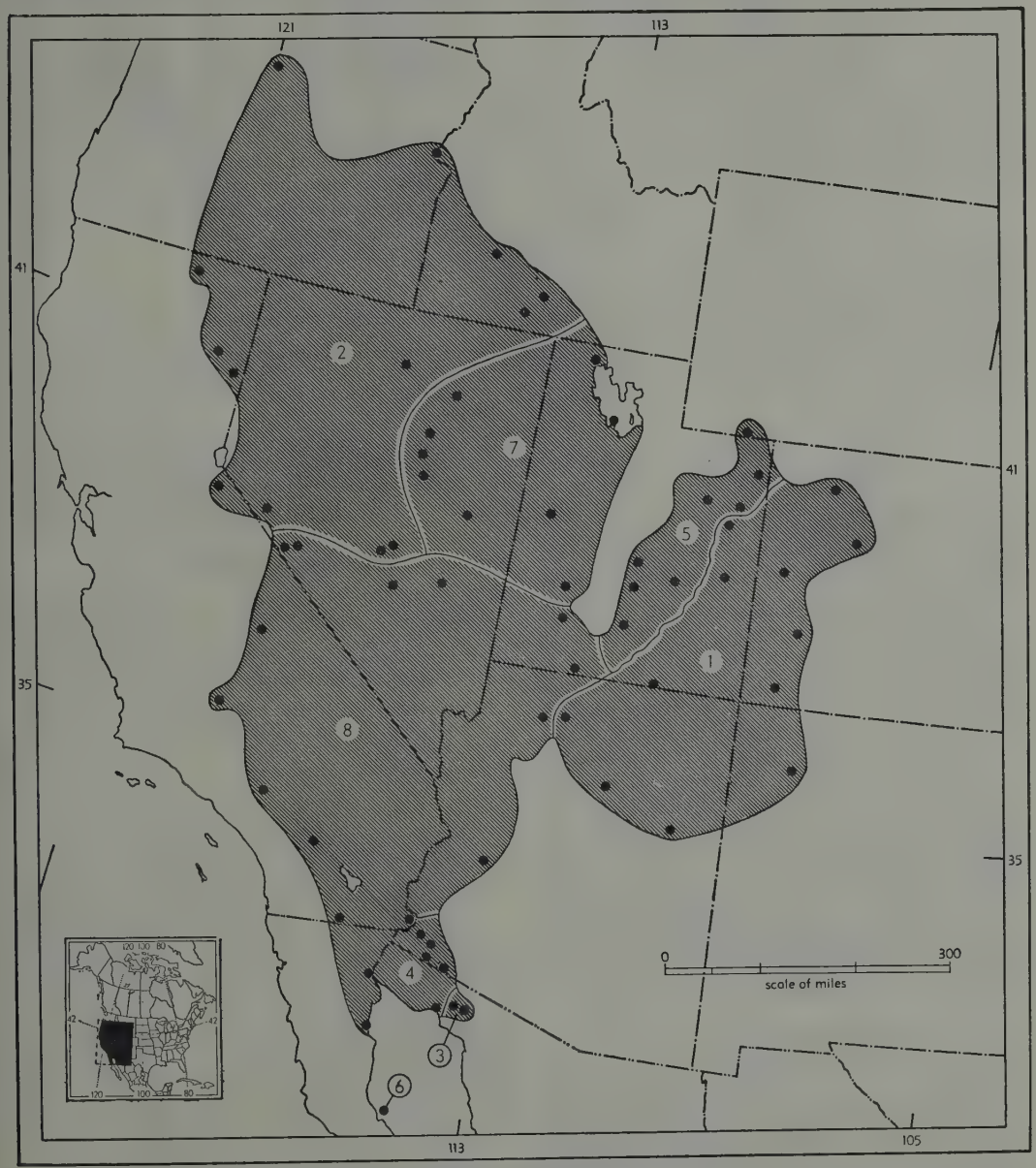
MARGINAL RECORDS.—Utah (Durrant, 1952:301): Kelton, 4225 ft.; type locality; White Valley; Beaver River, near Fort Cameron. Nevada (Hall, 1946:508): Water Canyon, 8 mi. N Lund; 8 mi. W Eureka; 4 mi. S Romano; Union; Elko.

Peromyscus crinitus stephensi Mearns

1897. *Peromyscus stephensi* Mearns, Proc. U. S. Nat. Mus., 19:721, July 30, type from 3 mi. E Mountain Spring, Imperial Co., California.
1909. *Peromyscus crinitus stephensi*, Osgood, N. Amer. Fauna, 28:232, April 17.
1904. *Peromyscus petraius* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):244, January 7, type from Lone Pine, Inyo Co., California.

MARGINAL RECORDS (Hall and Hoffmeister, 1942: 60–61, unless otherwise noted).—Nevada (Hall, 1946:509): 14–15 mi. SW Sunnyside, White River Valley, 5800 ft. Utah (Durrant, 1952:305): Parowan; Kanab, 5200 ft.

Arizona: lower end Toroweap Valley, 4200 ft.; Harquahala Mts., 3400 ft. California: Potholes, Colorado River. Baja California: El Mayor, Hardy River, 30 ft.; San Felipe. California: 1 mi. E Mountain Spring, 2000 ft.; Palm Springs, 452 ft.; Lovejoy Spring; mouth Kern River Canyon, 15 mi. NE Bakersfield; Bullfrog Lake, 10,600 ft. Nevada (Hall, 1946:509): Huntoon Valley, 5700 ft.; Marietta, 4900 ft.; Old Mill, N end Reveille Valley, 6200 ft.



Map 352. *Peromyscus crinitus.*

1. *P. c. auripectus*
2. *P. c. crinitus*
3. *P. c. delgadilli*
4. *P. c. disparilis*
5. *P. c. doutti*
6. *P. c. pallidissimus*
7. *P. c. pergracilis*
8. *P. c. stephensi*

Peromyscus collatus Burt
Turner Island Canyon Mouse

1932. *Peromyscus collatus* Burt, Trans. San Diego Soc. Nat. Hist., 7:172, October 31, type from Turners Island, lat. 28° 43′ N, long. 112° 19′ W, Gulf of California, Sonora. Known only from the type locality.

Average external measurements of 10 specimens are: 174; 94; 20; 15. Externally similar to *Peromyscus eremicus tiburonensis* Mearns, especially in coloration and pelage; color darker than in *Peromyscus crinitus stephensi* Mearns; size about as in *tiburonensis* and *stephensi*. Skull with zygomata compressed anteriorly; rostrum depressed, short, and broad; first and second upper molars with rudimentary accessory tubercles between outer primary tubercles as in *stephensi*, but differing from *stephensi* in broader, shorter rostrum with correlated broad incisors, and in having somewhat less inflated audital bullae (after Burt, 1932: 172–173).

Peromyscus pseudocrinitus Burt
False Canyon Mouse

1932. *Peromyscus pseudocrinitus* Burt, Trans. San Diego Soc. Nat. Hist., 7:173, October 31, type from Coronados Island, lat. 26° 06′ N, long. 111° 18′ W, Gulf of California, Baja California. Known only from the type locality.

Average external measurements of 6 specimens are: 194; 110; 21; 16. Darkest of the kinds of *Peromyscus* known from the islands in the Gulf of California; tail long, scantily-haired, and proximal two-thirds distinctly bicolor. Upper parts plumbeous-black washed with cinnamon; underparts white. General outline of skull similar to that of *crinitus*, but skull larger and with relatively less inflated audital bullae; nasals broad, parallel-sided, and bluntly rounded at posterior termination; premaxillae extend slightly behind nasals; accessory tubercles between outer primary tubercles in first and second upper molars more prominent than in *crinitus*; shelf of bony palate shorter than maxillary tooth-row; interparietal divided in four of seven specimens (after Burt, 1932:173).

Peromyscus californicus
California Mouse

External measurements: 220–266; 117–148; 25–29; 20–25. Upper parts approximately russet mixed with dark brown, the color varying with subspecies; underparts pale (approaching white), often with buffy pectoral spot; feet white or almost so; orbital ring dusky; tail bicolor, but usually not sharply so. Skull large; braincase well inflated; tympanic bullae large, well inflated; molars robust; two simple involutions apparent on labial sides of partly worn M1 and M2. Pelage long, lax; tail well haired but scaly annulations visible.

Peromyscus californicus inhabits chaparral-covered hillsides and ravines. The nest is definitely elaborate for a deer mouse and consists usually of a mass of sticks and twigs containing a chamber lined with fine grasses. Man-made shelter is often employed as a nest site. This mouse breeds throughout the year, but more frequently in summer and rarely in winter. There are usually three or four litters per year with a mean of approximately 2 (1–3) young per litter.

Peromyscus californicus benitoensis Grinnell and Orr

1934. *Peromyscus californicus benitoensis* Grinnell and Orr, Jour. Mamm., 15:216, August 10, type from near Cook Post Office, 1300 ft., Bear Valley, San Benito Co., California.

MARGINAL RECORDS.—California: Calaveras Valley, near Mt. Hamilton (Hooper, 1944:51); vicinity San Benito (*op. cit.*:53); vicinity Hernandez (*ibid.*); 2 mi. S San Miguel (Grinnell and Orr, 1934:217); Jolon (*ibid.*); type locality.

Peromyscus californicus californicus (Gambel)

1848. *Mus californicus* Gambel, Proc. Acad. Nat. Sci. Philadelphia, 4:78, August, type from Monterey, Monterey Co., California.

1895. *Peromyscus californicus*, Rhoads, Proc. Acad. Nat. Sci., Philadelphia, 47:34, February 21.

MARGINAL RECORDS (Grinnell and Orr, 1934:216, unless otherwise noted).—California: Seaside; Santa Margarita; Gaviota Pass (Osgood, 1909:237), thence northward along coast to point of beginning.

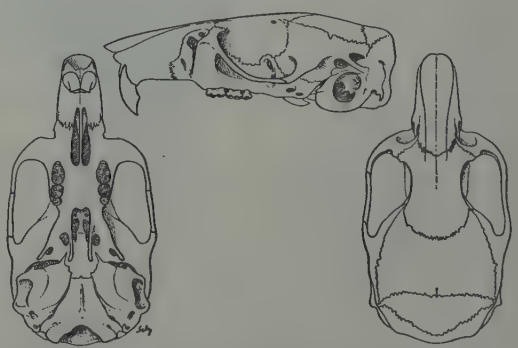
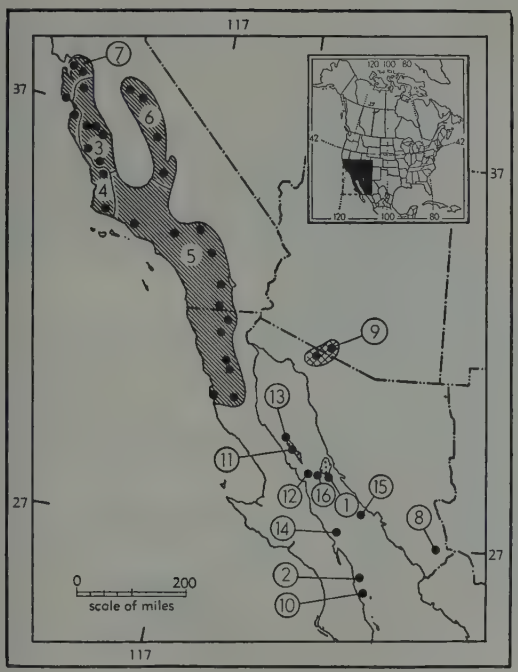


Fig. 343. *Peromyscus californicus parasiticus*, ¼ mi. E Stadium, Berkeley, Alameda Co., California, No. 53372 M.V.Z., ♀, X 1½.



Map 353. Several species of *Peromyscus*.

1. *P. collatus*
2. *P. pseudocrinitus*
3. *P. californicus benitoensis*
4. *P. californicus californicus*
5. *P. californicus insignis*
6. *P. californicus mariposae*
7. *P. californicus parasiticus*
8. *P. merriami goldmani*
9. *P. merriami merriami*
10. *P. caniceps*
11. *P. guardia guardia*
12. *P. guardia interparietalis*
13. *P. guardia mejiae*
14. *P. dickeyi*
15. *P. pembertoni*
16. *P. stephani*

Peromyscus californicus insignis Rhoads

1895. *Peromyscus insignis* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 47:33, February 21, type from Dulzura, San Diego Co., California.
1907. *Peromyscus californicus insignis,* Mearns, Bull. U. S. Nat. Mus., 56:429, April 13.

MARGINAL RECORDS (Grinnell and Orr, 1934:220, unless otherwise noted).—California: Matilija; San Gabriel Mts. (Osgood, 1909:238); 2 mi. E Strawberry Peak; San Gorgonio Pass; San Felipe Valley; Mountain Spring. Baja California: Los Pozos, 4200 ft., Sierra Juárez; El Rayo (Osgood, 1909:238); El Valle de la Trinidad, 2500 ft.; Concepción, 6000 ft.; Rosarito (Osgood, 1909:238); San Quintín (*ibid.*), thence northward along coast to point of beginning.

Peromyscus californicus mariposae Grinnell and Orr

1934. *Peromyscus californicus mariposae* Grinnell and Orr, Jour. Mamm., 15:217, August 10, type from El Portal, 2500 ft., Mariposa Co., California.

MARGINAL RECORDS (Grinnell and Orr, 1934:218).—California: Pleasant Valley, 600 ft.; type locality; near Miramonte, 3200–3500 ft.; 12 mi. below Bodfish, 2000 ft.

Peromyscus californicus parasiticus (Baird)

1858. [*Hesperomys*] *parasiticus* Baird, Mammals, Repts. Expl. Surv. . . . , 8(1):479, July 14, type from Santa Clara Valley, Santa Clara Co., California.
1934. *Peromyscus californicus parasiticus,* Grinnell and Orr, Jour. Mamm., 15:213, August 10.

MARGINAL RECORDS (Grinnell and Orr, 1934:214).—California: vicinity Berkeley; W side Mt. Diablo; Valencia Park Ranch.

Peromyscus eremicus
Cactus Mouse

External measurements: 169–218; 92–128; 18–22; 13.4–17.8. Upper parts with ground color of ochraceous-buff overlaid with dusky, net effect being dull, pale gray; underparts white or whitish suffused with buff or tawny; tail faintly bicolor, dusky above, whitish below. Skull of average size for genus; braincase high and somewhat inflated; infraorbital region robust; nasals relatively broad, slightly concave posteriorly; maxillary tongues extending posteriorly beyond nasals. Tail markedly longer than head and body, but slightly pencilled, covered with short, fine hairs; ears relatively large and thin, almost naked or clothed with fine hairs; pelage soft, silky; darker tones of upper parts not concentrated medially, but more or less evenly distributed.

This species lives in low, hot deserts, often in stands of cactus, and breeds the year around except in the northern parts of its range. Embryos average 3.7 with recorded extremes of 1 to 4 (Asdell, 1946:237).

Peromyscus eremicus anthonyi (Merriam)

1887. *Hesperomys* (*Vesperimus*) *anthonyi* Merriam, Proc. Biol. Soc. Washington, 4:5, April 15, type from Camp Apache, Big Hachita Mts., Hidalgo Co., New Mexico.
1907. *Peromyscus aremicus anthonyi,* Mearns, Bull. U. S. Nat. Mus., 56:438, April 13.

MARGINAL RECORDS (Osgood, 1909:250, unless otherwise noted).—Arizona: Fort Verde; Tonto Creek. New Mexico: not far from Silver City (V. Bailey, 1932:160); Florida Mts. Sonora: Oposura (= Moctezuma) (Burt, 1938:57). Chihuahua: near Batopilas. Sinaloa: Culiacán. Sonora: Guaymas (Burt, 1938:57); *Ortiz* (*ibid.*); Ures (*ibid.*); Magdalena. Arizona: Tubac; Fairbank; San Bernardino Ranch. New Mexico: Canyon of Gila River, near Redrock (V. Bailey, 1932:160).

Peromyscus eremicus avius Osgood

1909. *Peromyscus eremicus avius* Osgood, N. Amer. Fauna, 28:247, April 17, type from Ceralbo Island, Gulf of California, Baja California. Known only from the type locality.

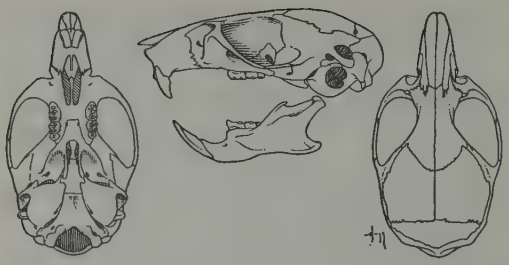


Fig. 344. *Peromyscus eremicus anthonyi,* 8½ mi. N and 2½ mi. W Nogales, 3400 ft., Santa Cruz Co., Arizona, No. 22840 K.U., ♀, X 1½.

Peromyscus eremicus carmeni Townsend

1912. *Peromyscus eremicus carmeni* Townsend, Bull. Amer. Mus. Nat. Hist., 31:126, June 14, type from Carmen Island, Gulf of California, Baja California. Known only from the type locality.

Peromyscus eremicus cedrosensis J. A. Allen

1898. *Peromyscus cedrosensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:154, April 12, type from Cerros (= Cedros) Island, Baja California. Known only from the type locality.
1909. *Peromyscus eremicus cedrosensis,* Osgood, N. Amer. Fauna, 28:244, April 17.

Peromyscus eremicus cinereus Hall

1931. *Peromyscus eremicus cinereus* Hall, Proc. Biol. Soc. Washington, 44:87, June 29, type from SW end San José Island, lat. 25° N, Baja California. Known only from the type locality.

Peromyscus eremicus eremicus (Baird)

1858. *Hesperomys eremicus* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):479, July 14, type from Old Fort Yuma, Imperial Co., California, on Colorado River, opposite Yuma, Arizona.
1895. *Peromyscus eremicus,* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:226, June 29.
1896. *Peromyscus eremicus arenarius* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 2, May 25 (preprint of Proc. U. S. Nat. Mus., 19:138, December 21, 1896), type from near El Paso, El Paso Co., Texas.

MARGINAL RECORDS (Osgood, 1909:242, unless otherwise noted).—Northern segment of range: Nevada: 8 mi. SE Johnnies Water, 4600 ft. (Lee, 1954:450); Meadow Valley Wash, 21 mi. S Caliente, 3200 ft. (Hall, 1946:511). Utah: near Watercress Spring (Hardy, 1945:98). Arizona: Painted Desert; Big Sandy Creek; Ehrenberg; 5 mi. N Wickenburg (Hatfield, 1942:1954); Phoenix; Fort Grant; SE Portal P.O. (Cahalane, 1939:432); Fort Huachuca; near Tumacacori Mission (Burt, 1933:120); La Osa. Sonora (Burt, 1938: 55, unless otherwise noted): Cerro Blanco; Providencia mines; 2 mi. ENE Hermosillo, 800 ft. (23290 KU); Costa Rica ranch; Sargent's Point, thence along Gulf Coast to Baja California: Yubay; Agua Dulce; Esperanza Cañon; Cocopah Mts.; *Gardner Lagoon.* California (Grinnell, 1933: 173): NE flank Santa Rosa Mts.; Banning; Oro Grande; Furnace Creek, Death Valley. Nevada (Hall, 1946:511): 2½ mi. E, 1 mi. S Grapevine Peak, 7000 ft.; 8 mi. NE Johnnies Water (52443 KU).

Southern segment of range: New Mexico: Mal Pais Spring, 25 mi. N Tularosa; Carlsbad (V. Bailey, 1932:158). Texas (Blair, 1952:242): Comstock; Apache ranch. Coahuila: Monclova; Jaral; Carneros; Sierra Encarnación (Hall and Kelson, 1952:368); Baker (1956:260) assigned the material from W Coahuila to *phaeurus* after our Map 354 was made. Durango: 3 mi. NNW Cuencamé, 5400 ft. (40671 KU); Indé. Chihuahua: Chihuahua. New Mexico (V. Bailey, 1932:158): near El Paso; Lake Valley; Cuchillo.

Peromyscus eremicus eva Thomas

1898. *Peromyscus eva* Thomas, Ann. Mag. Nat. Hist., ser. 7, 1:44, January, type from San José del Cabo, Baja California.
1909. *Peromyscus eremicus eva,* Osgood, N. Amer. Fauna, 28:245, April 17.
1898. *Peromyscus eremicus propinquus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:154, April 12, type from San Pablo Point, Baja California.

MARGINAL RECORDS (Osgood, 1909:246).—Baja California: Playa María Bay; Calmallí; El Potrero, thence southward throughout peninsula.

Peromyscus eremicus fraterculus (Miller)

1892. *Vesperimus fraterculus* Miller, Amer. Nat., 26:261, March, cotypes from Dulzura, San Diego Co., California.
1898. *P[eromyscus]. eremicus fraterculus,* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:154, April 12.
1893. *Sitomys herronii* Rhoads, Amer. Nat., 27:832, September, type from Reche Canyon, San Bernardino Co., California.
1894. *Sitomys herroni nigellus* Rhoads, Proc. Acad. Nat. Sci., Philadelphia, 46:257, October 23, type from West Cajon Pass, San Bernardino Co., California.
1903. *Peromyscus homochroia* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3(10):158, May 7, type from San Quintín, Baja California.

MARGINAL RECORDS.—California (Grinnell, 1933: 173): Nordhoff; Redlands. Baja California (Osgood, 1909: 244): Nachoguero Valley; Rancho Viejo; San Matías Spring; San Fernando, thence northward along coast to point of beginning.

Peromyscus eremicus insulicola Osgood

1909. *Peromyscus eremicus insulicola* Osgood, N. Amer. Fauna, 28:246, April 17, type from Espíritu Santo Island, Gulf of California, Baja California. Known only from the type locality.

Peromyscus eremicus papagensis Goldman

1917. *Peromyscus eremicus papagensis* Goldman, Proc. Biol. Soc. Washington, 30:110, May 23, type from Sierra Pinacate, Sonora. Known only from the type locality.

Peromyscus eremicus phaeurus Osgood

1904. *Peromyscus eremicus phaeurus* Osgood, Proc. Biol. Soc. Washington, 17:75, March 21, type from Hacienda la Parada, San Luis Potosí.

Map 354. *Peromyscus eremicus.*

Guide to subspecies
1. *P. e. anthonyi*
2. *P. e. avius*
3. *P. e. carmeni*
4. *P. e. cedrosensis*
5. *P. e. cinereus*
6. *P. e eremicus*
7. *P. e. eva*
8. *P. e. fraterculus*
9. *P. e. insulicola*
10. *P. e. papagensis*
11. *P. e. phaeurus*
12. *P. e. polypolius*
13. *P. e. pullus*
14. *P. e. tiburonensis*

MARGINAL RECORDS (Osgood, 1909:251).—Coahuila: Sabinas. Nuevo León: Doctor Arroyo. San Luis Potosí (Dalquest, 1953b:155): 10 mi. NW Ciudad del Maíz; San José de Albuquerque; 1 mi. W Bledos; Cerro Peñón Blanco. Zacatecas: Cañitas. Coahuila: Saltillo.—Baker (1956:260) assigned material from still farther W in Coahuila to *phaeurus* after our Map 354 was made.

Peromyscus eremicus polypolius Osgood

1909. *Peromyscus eremicus polypolius* Osgood, N. Amer. Fauna, 28:248, April 17, type from Margarita Island, off west coast of southern Baja California. Known only from the type locality.

Peromyscus eremicus pullus Blossom

1933. *Peromyscus eremicus pullus* Blossom, Occas. Papers Mus. Zool., Univ. Michigan, 265:3, June 21, type from Black Mtn., 10 mi. S Tucson, Pima Co., Arizona. Known only from the type locality.

Peromyscus eremicus tiburonensis Mearns

1897. *Peromyscus tiburonensis* Mearns, Proc. U. S. Nat. Mus., 19:720, July 30, type from Tiburón Island, Gulf of California, Sonora. Known only from Tiburón Island.
1909. *Peromyscus eremicus tiburonensis,* Osgood, N. Amer. Fauna, 28:250, April 17.

Peromyscus merriami
Merriam's Mouse

External measurements: 197–218; 102–118; 20–24. This species so closely resembles *P. eremicus,* which is found at the same localities as *P. merriami,* that the two are separated only with difficulty except when the differently-shaped bacula are compared. The braincase of *P. merriami* is more nearly flat

and the species averages larger than *P. eremicus* at the same places.

Peromyscus merriami goldmani Osgood

1904. *Peromyscus goldmani* Osgood, Proc. Biol. Soc. Washington, 17:75, March 21, type from Alamos, Sonora. Known only from the type locality.
1952. *Peromyscus merriami goldmani*, Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:368, December 15.

Peromyscus merriami merriami Mearns

1896. *Peromyscus merriami* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 2, May 25 (preprint of Proc. U. S. Nat. Mus., 19:138, December 21, 1896), type from Sonoyta, Sonora.

MARGINAL RECORDS.—Arizona: Quitobaquita (Hall and Kelson, 1952:368). Sonora: type locality.

Peromyscus caniceps Burt
Burt's Deer Mouse

1932. *Peromyscus caniceps* Burt, Trans. San Diego Soc. Nat. Hist., 7:174, October 31, type from Monserrate Island, lat. 25° 38′ N, long. 111° 02′ W, Gulf of California, Baja California. Known only from the type locality. See Map 353.

External measurements of type, an adult male, and the average of 16 topotypes are, respectively: 199, 202; 111, 112; 21, 22; 15, 15.5. Back and sides heavily washed with ochraceous-buff; head grayish, contrasting with back and sides; lateral line indistinct; underparts white washed with buff (in some specimens, "ochraceous-buff" of sides continuing ventrally, with no break in region of lateral line, and covering entire ventral surface except throat and chin); tail indistinctly bicolor, dusky above, whitish below; ears dusky. Skull more angular than in *pseudocrinitus*; zygomatic process of squamosal projects laterally noticeably beyond border of braincase, arches tapering anteriorly; 1st and 2nd upper molars with accessory tubercles in 13 out of 20 specimens; shelf of bony palate longer than maxillary tooth-row; auditory bullae small; nasals tapering slightly posteriorly (after Burt, 1932:174).

Peromyscus guardia
Angel Island Mouse

External measurements: 207–216; 114–122; 22–24; 17–18. Color much as in *P. eremicus*. Skull markedly arched in dorsal profile; rostrum long; anterior palatine foramina not reaching posteriorly to plane of molars; interpterygoid fossae wide; tympanic bullae large. See Map 353.

Peromyscus guardia guardia Townsend

1912. *Peromyscus guardia* Townsend; Bull. Amer. Mus. Nat. Hist., 31:126, June 14, type from Angel de la Guarda Island, Gulf of California, Baja California. Known only from the type locality. See Map 353.

Peromyscus guardia interparietalis Burt

1932. *Peromyscus guardia interparietalis* Burt, Trans. San Diego Soc. Nat. Hist., 7:175, October 31, type from South San Lorenzo Island, lat. 28° 36′ N, long. 112° 51′ W, Gulf of California, Baja California. Known only from the type locality. See Map 353.

Peromyscus guardia mejiae Burt

1932. *Peromyscus guardia mejiae* Burt, Trans. San Diego Soc. Nat. Hist., 7:174, October 31, type from Mejía Island, lat. 29° 33′ N, long. 113° 35′ W, Gulf of California, Baja California. Known only from the type locality. See Map 353.

Peromyscus dickeyi Burt
Dickey's Deer Mouse

1932. *Peromyscus dickeyi* Burt, Trans. San Diego Soc. Nat. Hist., 7:176, October 31, type from Tortuga Island, lat. 27° 21′ N, 111° 54′ W, Gulf of California, Baja California. Known only from the type locality. See Map 353.

External measurements of the type, an adult male, and average of 17 topotypes are, respectively: 185, 191; 82, 91; 23, 22; 18, 20. Upper parts dusky washed with pinkish cinnamon; ears dusky; lateral line present; underparts white, sometimes with buffy pectoral spot. "Skull broad and squarely built; zygomatic arches nearly parallel-sided; rostrum heavy; nasals wide anteriorly; premaxillae project well beyond posterior limits of nasals; incisors heavy; audital bullae small; lower jaw heavy, nearly as large as in *Peromyscus californicus insignis* Rhoads; ridges for muscle attachments prominent" (Burt, 1932:176).

Peromyscus pembertoni Burt
Pemberton's Deer Mouse

1932. *Peromyscus pembertoni* Burt, Trans. San Diego Soc. Nat. Hist., 7:176, October 31, type from San Pedro Nolasco Island, lat. 27° 58′ N, long. 111° 24′ W, Gulf of California, Sonora. Known only from the type locality. See Map 353.

External measurements of the type, an adult male, and average of 10 topotypes are, respectively: 210, 208; 100, 103; 24, 24; 18, 18. Color of upper parts "light vinaceous-cinnamon" lightly mixed with fine dusky lines on back, noticeably paler than in *dickeyi*; head somewhat paler than back; tail bi-

color, brownish above, white below; underparts white. Skull resembling that of *dickeyi*, but larger and heavier; zygomatic arches tapering anteriorly; sutures between frontals and parietals form acute angle in median line; interparietal narrow anteroposteriorly; rostrum heavy as in *dickeyi*; premaxillae extending posteriorly beyond nasals. *Peromyscus pembertoni* differs from all species of the subgenus *Haplomylomys* except *dickeyi* in relatively shorter tail (after Burt, 1932:177).

Peromyscus stephani Townsend
San Esteban Island Mouse

1912. *Peromyscus stephani* Townsend, Bull. Amer. Mus. Nat. Hist., 31:126, June 14, type from San Esteban Island, Gulf of California, Baja California. Known only from the type locality. See Map 353.

Average external measurements of 4 specimens are: 195; 97; 22. In color close to typical *eremicus*; tail averaging shorter and hind foot larger. Skull decidedly shorter than in *eremicus*, dentition about the same; nasals more pointed posteriorly and reaching beyond premaxillae; frontals meet posteriorly at an angle on median line, instead of forming curve as in *eremicus* (after Townsend, 1912:126).

Subgenus **Peromyscus** Gloger

Revised by Osgood, N. Amer. Fauna, 28:33–218, April 17, 1909.

1841. *Peromyscus* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, 1:95. Type, *Peromyscus arboreus* Gloger [= *Mus sylvaticus noveboracensis* Fischer].

1894. *Trinodontomys* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:257, October. Type, *Sitomys insolatus* Rhoads [= *Hesperomys sonoriensis* Le Conte].

Pattern of color usually bicolor; underparts usually white and sharply distinguished from the upper parts; ears more or less dusky, somewhat contrasted with rest of upper parts; plantar tubercles 6; mammae $\frac{3}{3}$ (i. $\frac{2}{2}$, a. $\frac{0}{0}$, p. $\frac{1}{1}$). Posterior palatine foramina about midway between interpterygoid fossa and anterior palatine foramina; coronoid process of mandible usually small and only slightly elevated; accessory tubercles present in salient angles of 1st and 2nd upper molars; outer accessory tubercles of m1 and m2 only slightly developed; dentine spaces of worn molars mostly confluent (after Osgood, 1909:33–34).

Keys to Nominal Species of Subgenus Peromyscus

A. Occurring North of México

1. Occurring on islands of coastal British Columbia and southern Alaska.
   2. Hind foot 25 or more. . . . . *P. sitkensis*, p. 625
   2′. Hind foot 25 or less. . . . . *P. maniculatus*, p. 612
1′. Not occurring on islands of coastal British Columbia and southern Alaska.
   3. Ear (dry) 75 per cent or more as long as hind foot.
      4. Ear (dry) usually more than 22; tail-length equal to or more than length of head and body. *P. truei*, p. 639
      4′. Ear (dry) usually less than 22; tail-length less than length of head and body. . . *P. nasutus*, p. 642
   3′. Ear (dry) less than 75 per cent as long as hind foot.
      5. Tail usually less than 91.
         6. Total length less than 154.
            7. Occurring in southeastern United States south of northern Georgia. . . *P. polionotus*, p. 625
            7′. Not occurring in southeastern United States south of northern Georgia. *P. maniculatus*, p. 612
         6′. Total length more than 154.
            8. Greatest length of skull more than 28 or, if less, occurring in Florida. . *P. gossypinus*, p. 631
            8′. Greatest length of skull less than 28.
               9. Occurring mainly in northern and western United States; where occurring in eastern and central United States, tail usually less than 65 and sharply bicolored, skull usually less than 22. . . . . *P. maniculatus*, p. 612
               9′. Occurring in central and eastern United States, those populations occurring in the range of *P. maniculatus* usually with tail more than 65 and unicolored (or at most faintly bicolored), skull more than 22. . . . . *P. leucopus*, p. 628
      5′. Tail usually more than 91.
         10. Tail usually shorter than head and body or, if longer, occurring in the Pacific Northwest; tail not penicillate.
            11. Occurring on either Marthas Vineyard Island, Massachusetts, or in southwestern United States. . . . . *P. leucopus*, p. 628

11′. Not occurring on Marthas Vineyard Island, Massachusetts, nor in southwestern United States. *P. maniculatus*, p. 612

10′. Tail usually shorter than head and body, penicillate.
12. Molar tooth-row less than 3.9. . . . . *P. pectoralis*, p. 637
12′. Molar tooth-row more than 3.9. . . . . *P. boylii*, p. 633

B. Occurring in México

1. Occurring on islands in Gulf of California.
2. Occurring on Santa Catalina Island, Baja California. . . . . *P. slevini*, p. 624
2′. Not occurring on Santa Catalina Island, Baja California.
3. Occurring on Santa Cruz and San Diego islands, Baja California. . . . . *P. sejugis*, p. 624
3′. Not occurring on Santa Cruz and San Diego islands, Baja California.
4. Occurring on San Pedro Nolasco Island, Sonora. . . . . *P. boylii*, p. 633
4′. Occurring on unnamed island in Gonzaga Bay, Baja California. . . . *P. maniculatus*, p. 612
1′. Not occurring on islands in Gulf of California.
5. Occurring on Peninsula of Yucatán.
6. Total length more than 206. . . . . *P. yucatanicus*, p. 652
6′. Total length less than 206. . . . . *P. leucopus*, p. 628
5′. Not occurring on Peninsula of Yucatán.
7. Length of ear (dry) more than 75 per cent of length of hind foot.
8. Occurring in mountains of east-central Veracruz.
9. Hind foot less than 24. . . . . *P. bullatus*, p. 642
9′. Hind foot 24 or more. . . . . *P. difficilis*, p. 643
8′. Not occurring in mountains of east-central Veracruz.
10. Total length more than 212 and not in Baja California. . . . . *P. difficilis*, p. 643
10′. Total length less than 212 or, if more, in Baja California. . . . . *P. truei*, p. 639
7′. Length of ear (dry) less than 75 per cent of length of hind foot.
11. Total length more than 300. . . . . *P. zarhynchus*, p. 654
11′. Total length less than 300.
12. Hind foot 30 or more.
13. Occurring north of 19° N lat.; nasals greatly expanded distally.
14. Upper parts not heavily washed with black. . . . . *P. latirostris*, p. 649
14′. Upper parts blackish mid-dorsally. . . . . *P. furvus*, p. 648
13′. Occurring south of 19° N lat.; nasals not greatly expanded distally.
15. Frontals distinctly beaded supraorbitally; feet dusky brown to base of toes. *P. melanocarpus*, p. 654
15′. Frontals only faintly beaded or not at all; feet not dusky brown to base of toes.
16. Dusky wash on upper parts that are approximately tawny; tail coarsely haired. . . . . *P. guatemalensis*, p. 647
16′. Blackish-brown and tawny; tail scantily haired. . . *P. megalops*, p. 653
12′. Hind foot less than 30.
17. Hind foot less than 25.
18. Tail more than 150. . . . . *P. mekisturus*, p. 645
18′. Tail less than 150.
19. Tail shorter than head and body.
20. Total length less than 210.
21. Tail usually sharply bicolored and penicillate; palatine slits usually long and nearly parallel-sided.
22. Rostrum long (nasals about 11). . . . *P. melanotis*, p. 627
22′. Rostrum shorter (nasals usually less than 11). *P. maniculatus*, p. 612
21′. Tail not sharply bicolored, slightly, if at all, penicillate; palatine slits variable. . . . . *P. leucopus*, p. 628
20′. Total length more than 210; hind foot 25 or more. *P. hylocetes*, p. 637
19′. Tail equal to or longer than head and body.
23. Tail unicolor black or brown.
24. Tail nearly naked and scaly. . . . . *P. allophylus*, p. 651
24′. Tail soft-haired and penicillate.

25. Total length more than 180; hind foot more than 22. . . . . *P. lophurus*, p. 646
25′. Total length less than 180; hind foot less than 22. . . . . *P. simulatus*, p. 646
23′. Tail more or less bicolored.
26. Supraorbital margin beaded or at least elevated.
27. Supraorbital beading well developed with distinct sulcus on inner side. *P. banderanus*, p. 652
27′. Supraorbital beading faintly developed; no distinct sulcus on internal side. *P. mexicanus*, p. 650
26′. Supraorbital margin neither beaded nor elevated (sometimes trenchant).
28. Occurring in highlands of Chiapas and Guatemala; tail softly haired, decidedly penicillate; pelage soft and dull. . . . . *P. lophurus*, p. 646
28′. Occurring north of Chiapas (except *P. boylii*, see 34 below); pelage variable.
29. Ears relatively large (approximately 70 per cent of length of hind foot). *P. polius*, p. 639
29′. Ears relatively small (less than 70 per cent of length of hind foot).
30. Hind foot 23 or more.
31. Tarsal joint white. . . . . *P. polius*, p. 639
31′. Dusky coloration extending distally to and usually over tarsal joint.
32. Tail usually less than 90. . . . . *P. leucopus*, p. 628
32′. Tail more than 90.
33. Underparts brownish or ochraceous; tail scantily haired. *P. ochraventer*, p. 649
33′. Underparts not conspicuously brownish or ochraceous; tail more fully haired.
34. Hind foot usually less than 25. . . . . *P. boylii*, p. 633
34′. Hind foot more than 25. . . . . *P. hylocetes*, p. 637
30′. Hind foot not more than 23.
35. Tail equal to or barely longer than head and body, usually less than 90.
36. Tail sharply bicolored, slightly penicillate. . . *P. maniculatus*, p. 612
36′. Tail not sharply bicolored or barely penicillate. . . *P. leucopus*, p. 628
35′. Tail always longer than head and body, usually more than 90.
37. Dusky of hind leg extending distally to and usually over tarsal joint.
38. Molar tooth-row usually 4 or more. . . . . *P. boylii*, p. 633
38′. Molar tooth-row usually less than 4. . . . . *P. pectoralis*, p. 637
37′. Tarsal joint white like upper side of foot.
39. Total length, 210–234. . . . . *P. polius*, p. 639
39′. Total length, 180–210. . . . . *P. pectoralis*, p. 637
17′. Hind foot 25 or more.
40. Tarsal joint white like upper side of foot. . . . . *P. polius*, p. 639
40′. Dusky of hind leg extending at least to tarsal joint.
41. Ear (dry) not more than 19.
42. Dusky of hind leg extending over foot at least halfway to base of toes.
43. Frontals with slight supraorbital bead.
44. Molar tooth-row less than 5. . . . . *P. mexicanus*, p. 650
44′. Molar tooth-row 5 or more. . . . . *P. megalops*, p. 653
43′. Frontals lacking supraorbital bead.
45. Color chiefly dusky; tail blackish all around or at least above and basally below.
46. Total length less than 240; tail less than 120. . . . . *P. lepturus*, p. 646
46′. Total length more than 240; tail more than 120. . . . . *P. furvus*, p. 648
45′. Color chiefly tawny or ochraceous; tail sharply and evenly bicolored. *P. boylii*, p. 633
42′. Dusky of hind leg not extending so far over foot as halfway to base of toes.
47. Supraorbital border slightly to strongly beaded or, if not, then tail not evenly bicolored.
48. Tail unicolored blackish. . . . . *P. megalops*, p. 653
48′. Tail evenly bicolored or blotched below with dusky or yellowish white.
49. Molar tooth-row 5 or more.
50. Ear from notch more than 19.5; back grayish; maxillary tooth-row 5.3. . . . . *P. furvus*, p. 648
50′. Ear from notch less than 19.5; back buffy; maxillary tooth-row 5.0. *P. sloeops*, p. 654

49′. Molar tooth-row less than 5.
51. Supraorbital border strongly beaded (except in *P. b. angelensis*); occurring in western México north of the Isthmus of Tehuantepec. . . . . *P. banderanus*, p. 652
51′. Supraorbital border slightly beaded; occurring in southern and eastern México. *P. mexicanus*, p. 650
47′. Supraorbital border not beaded but sometimes trenchant.
52. Tail unicolored brown. . . . . *P. perfulvus*, p. 636
52′. Tail evenly and usually sharply bicolored.
53. Total length more than 240. . . . . *P. oaxacensis*, p. 636
53′. Total length less than 240.
54. Hind foot less than 25. . . . . *P. boylii*, p. 633
54′. Hind foot more than 25. . . . . *P. hylocetes*, p. 637
41′. Ear (dry) more than 19.
55. Supraorbital border slightly beaded or at least somewhat elevated.
56. Sides of face chiefly grayish; tail evenly bicolored. . . . . *P. melanophrys*, p. 644
56′. Sides of face chiefly dusky; tail entirely dusky, irregularly blotched below or evenly bicolored.
57. Molar tooth-row 5 or more; braincase broad; pelage usually long. . *P. megalops*, p. 653
57′. Molar tooth-row less than 5; braincase usualy narrower; pelage usually short. *P. mexicanus*, p. 650
55′. Supraorbital border not beaded or elevated. . . . . *P. furvus*, p. 648

C. Occurring in Central America

1. Total length more than 295. . . . . *P. grandis*, p. 655
1′. Total length less than 295.
2. Occurring from Costa Rica southward. . . . . *P. nudipes*, p. 647
2′. Occurring north of Costa Rica.
3. Tail almost naked or only scantily covered with fine hairs.
4. Supraorbital border distinctly beaded. . . . . *P. mexicanus*, p. 650
4′. Supraorbital border not beaded.
5. Total length more than 230. . . . . *P. guatemalensis*, p. 647
5′. Total length less than 230.
6. Pelage long, lax, dark. . . . . *P. altilaneus*, p. 648
6′. Pelage short, relatively pale (buffy). . . . . *P. hondurensis*, p. 646
3′. Tail comparatively well haired.
7. Tail unicolored. . . . . *P. lophurus*, p. 646
7′. Tail bicolored, or at least underside marked with pale blotches.
8. Supraorbital ridges conspicuously trenchant and shelflike. . . . . *P. stirtoni*, p. 653
8′. Supraorbital ridges not trenchant or shelflike. . . . . *P. boylii*, p. 633

maniculatus-group

Peromyscus maniculatus

Deer Mouse

External measurements: 121–222; 46–123; 17–25; 12–20. Upper parts varying with subspecies but, in general, usually varying from pale grayish buff to deep reddish brown overlaid in varying degree by dusky; underparts white; tail clothed with short hairs, slightly penicillate, sharply bicolor, dark above, light below. Skull smooth and delicately built; braincase somewhat arched and well inflated; tympanic bullae moderate to small; rostrum slender, short, and tapered.

This species consists of a long series of intergrading populations. In a few instances, subspecies with adjoining geographic ranges do not intergrade directly but circuitously through other subspecies. Some subspecies—for example, *P. m. bairdii* and *P. m. gracilis*, in Michigan—occur in the same area, but are ecologically separated and interbreeding is minimal. For these reasons it is not possible to characterize the species with any great degree of precision.

The species occupies a remarkable variety of habitats. Some subspecies are comparatively ver-

satile in this respect and others more narrowly restricted in habitat.

Food is stored in important quantities. Both plant and animal material is eaten. In most places these mice are valuable as buffer species and it would be difficult to overemphasize their importance in the biotic community.

There are at least 3 pelages: juvenal, post-juvenal or subadult, and adult. The first pelage is distinctly gray and the color becomes progressively richer, that is, buffier, with succeeding molts. After adult pelage is attained, there is normally one annual molt. In temperate regions this molt usually takes place in late summer or early autumn, but varies in time of inception. Extreme wear in spring-taken specimens and alkaline bleaching of specimens from areas of strongly saline soils are sometimes mistaken for an additional molt.

These animals, especially the females in the breeding season, occupy definite territories. Further, there is evidence of a pronounced homing instinct.

Embryos average 5 (1–8). The gestation period is 21 to 27 days. Young are able to begin breeding 6 to 7 weeks after birth. These mice breed in all months but less often in autumn and winter and perhaps not at all in those two seasons in the northern parts of the geographic range of the species.

Peromyscus maniculatus abietorum Bangs

1896. *Peromyscus canadensis abietorum* Bangs, Proc. Biol. Soc. Washington, 10:49, March 9, type from James River, Nova Scotia.
1909. *Peromyscus maniculatus abietorum*, Osgood, N. Amer. Fauna, 28:45, April 17.

MARGINAL RECORDS (Osgood, 1909:46).—Quebec: Riviere du Loup, Gaspé Peninsula, thence along Atlantic Coast including Prince Edward Island and Nova Scotia to Maine: Big Deer Isle; Greenville.

Peromyscus maniculatus algidus Osgood

1909. *Peromyscus maniculatus algidus* Osgood, N. Amer. Fauna, 28:56, April 17, type from head of Lake Bennett (site of old Bennett City), British Columbia.

MARGINAL RECORDS.—Yukon: 6 mi. SW Kluane, 2550 ft. (Baker, 1951:101); 3 mi. NW Whitehorse (*ibid.*); *2 mi. S Whitehorse* (*ibid.*); Lake Tagish (Anderson, 1947: 136). Alaska: 1 mi. W Haines (Baker and Findley, 1954: 477); *E side Chilkat River, 100 ft., 9 mi. W, 4 mi. N Haines* (Baker, 1951:101).

Peromyscus maniculatus alpinus Cowan

1937. *Peromyscus maniculatus alpinus* Cowan, Proc. Biol. Soc. Washington, 50:215, December 28, type from Mt. Revelstoke, 6000 ft., 19 mi. NE Revelstoke, British Columbia.

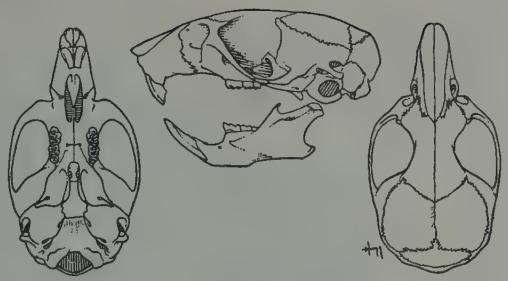


Fig. 345. *Peromyscus maniculatus bairdii*, 8.1 mi. E Arkansas City, Cowley Co., Kansas, No. 39268 K.U., ♀, X 1½.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:179): Kinbasket Lake; Glacier; type locality.

Peromyscus maniculatus anacapae von Bloeker

1942. *Peromyscus maniculatus anacapae* von Bloeker, Bull. Southern California Acad. Sci., 40(3):161, January 31, type from Fish Camp, West Anacapa Island, Ventura Co., California. Known from *West*, Middle, and *East* Anacapa islands, California (von Bloeker, 1941:161).

Peromyscus maniculatus angustus Hall

1932. *Peromyscus maniculatus angustus* Hall, Univ. California Publ. Zool., 38:423, November 8, type from Beaver Creek, 15 mi. NW Alberni, Vancouver Island, British Columbia.

MARGINAL RECORDS (Anderson, 1947:136).—British Columbia (Vancouver Island): Sayward; type locality, thence around coast to Nootka Sound. Recorded by Cowan and Guiguet (1956:179) also from Newcastle, Sidney, Bare, and Saltspring islands.

Peromyscus maniculatus anticostiensis Moulthrop

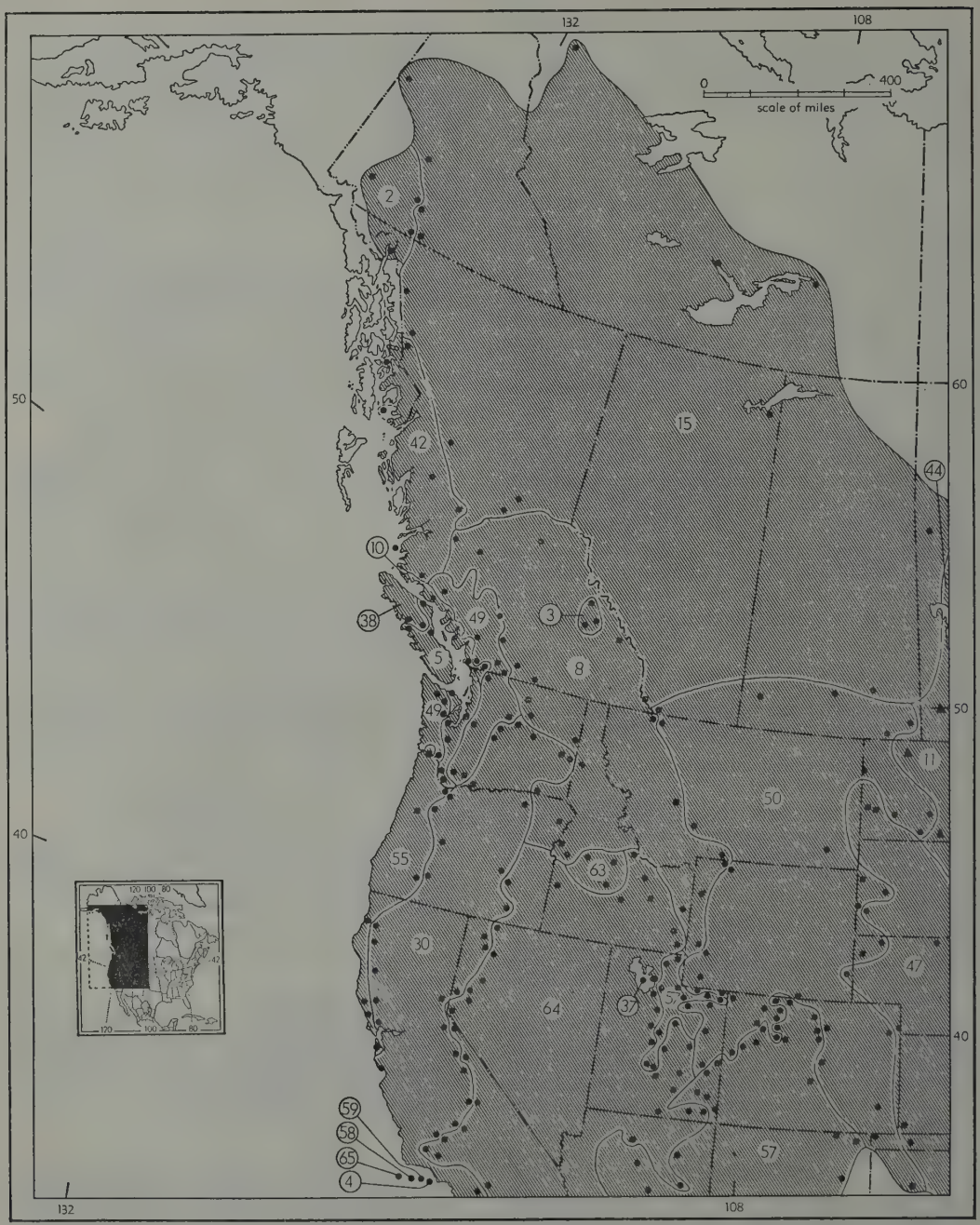
1937. *Peromyscus maniculatus anticostiensis* Moulthrop, Sci. Publ. Cleveland Mus. Nat. Hist., 5(3):11, December 4, type from Fox Bay, E end Anticosti Island, Quebec. Known only from the type locality.

Peromyscus maniculatus argentatus Copeland and Church

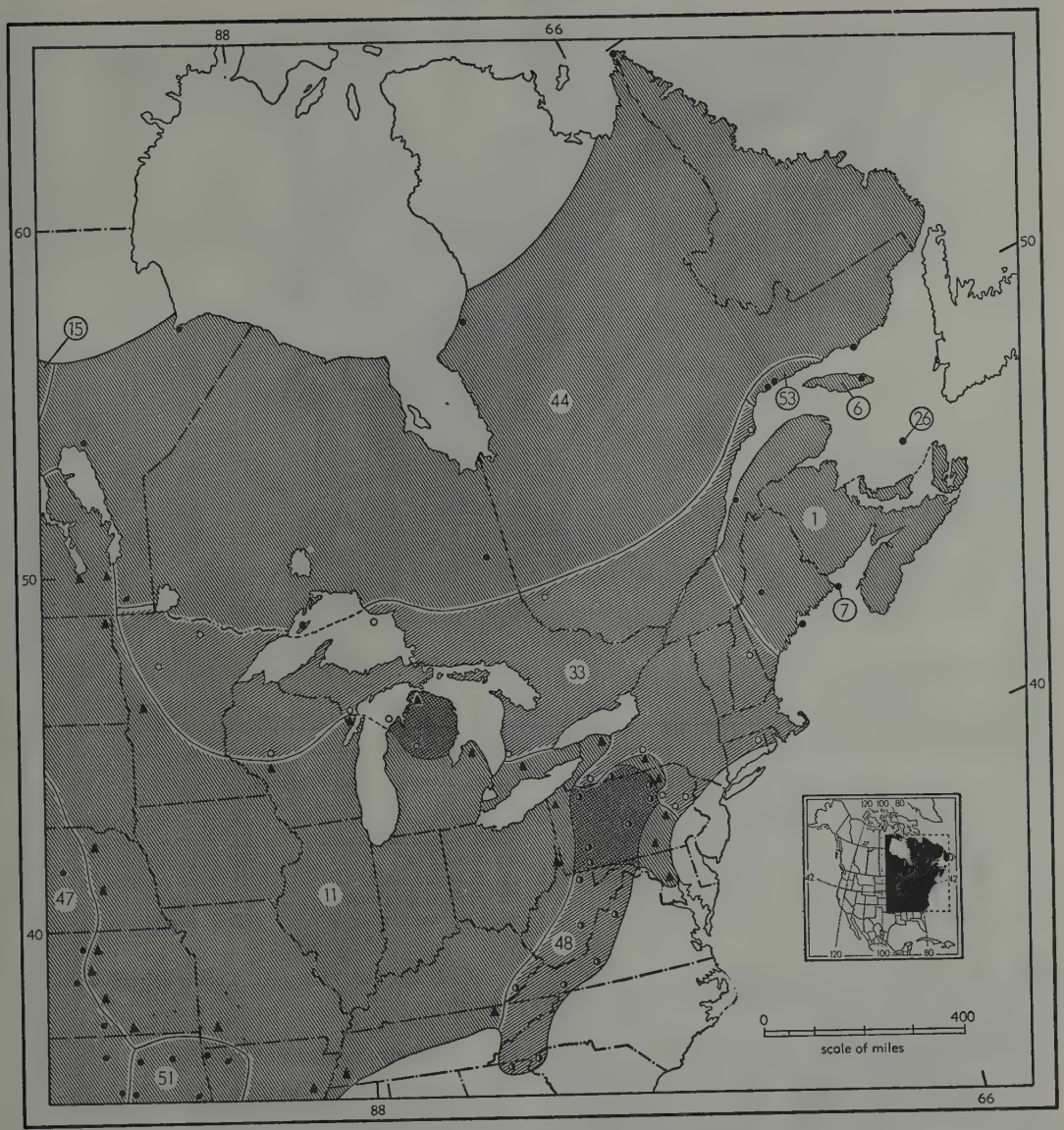
1906. *Peromyscus canadensis argentatus* Copeland and Church, Proc. Biol. Soc. Washington, 19:122, September 6, type from Grand Harbor, Grand Manan Island, New Brunswick. Known only from Grand Manan Island.
1909. *Peromyscus maniculatus argentatus*, Osgood, N. Amer. Fauna, 29:46, April 17.

Peromyscus maniculatus artemisiae (Rhoads)

1894. *Sitomys americanus artemisiae* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:260, October, type from Ashcroft, British Columbia.
1909. *Peromyscus maniculatus artemisiae*, Osgood, N. Amer. Fauna, 28:58, April 17.



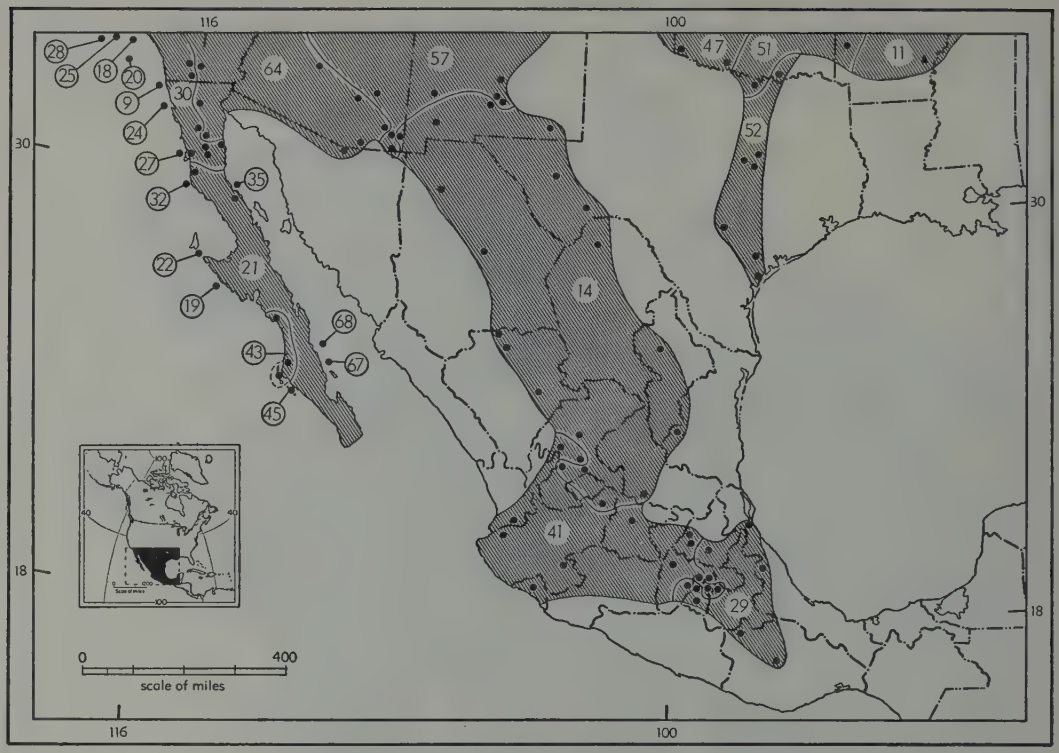
Map 355. Some subspecies of *Peromyscus maniculatus*. (See guide to Map 356.)



Map 356. Some subspecies of *Peromyscus maniculatus*. (Names following numerals are a guide to both maps 355 and 356.)

Guide

1. *P. m. abietorum*
2. *P. m. algidus*
3. *P. m. alpinus*
4. *P. m. anacapae*
5. *P. m. angustus*
6. *P. m. anticostiensis*
7. *P. m. argentatus*
8. *P. m. artemisiae*
10. *P. m. austerus*
11. *P. m. bairdii*
15. *P. m. borealis*
26. *P. m. eremus*
30. *P. m. gambelii*
33. *P. m. gracilis*
37. *P. m. inclarus*
38. *P. m. interdictus*
42. *P. m. macrorhinus*
44. *P. m. maniculatus*
47. *P. m. nebrascensis*
48. *P. m. nubiterrae*
49. *P. m. oreas*
50. *P. m. osgoodi*
51. *P. m. ozarkiarum*
53. *P. m. plumbeus*
55. *P. m. rubidus*
57. *P. m. rufinus*
58. *P. m. sanctaerosae*
59. *P. m. santacruzae*
63. *P. m. serratus*
64. *P. m. sonoriensis*
65. *P. m. streatori*



Map 357. *Peromyscus maniculatus* (part), *P. sejugis*, and *P. slevini*.

9. *P. m. assimilis*
14. *P. m. blandus*
18. *P. m. catalinae*
19. *P. m. cineritius*
20. *P. m. clementis*
21. *P. m. coolidgei*
22. *P. m. dorsalis*
24. *P. m. dubius*
25. *P. m. elusus*
27. *P. m. exiguus*
28. *P. m. exterus*
29. *P. m. fulvus*
30. *P. m. gambelii*
32. *P. m. geronimensis*
35. *P. m. hueyi*
41. *P. m. labecula*
43. *P. m. magdalenae*
45. *P. m. margaritae*
51. *P. m. ozarkiarum*
52. *P. m. pallescens*
57. *P. m. rufinus*
64. *P. m. sonoriensis*
67. *P. sejugis*
68. *P. slevini*

1899. *Peromyscus texanus subarcticus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 12:15, March 4, type from Deerlodge County, Montana.

MARGINAL RECORDS (Osgood, 1909:60–61, unless otherwise noted).—British Columbia (Cowan and Guiguet, 1956:180): Indianpoint Lake; Field. Montana: St. Mary Lake; Helena; Beartooth Mts. Wyoming: Clarks Fork; Jackson Hole; La Barge Creek. Idaho (Davis, 1939:290): S side Snake River, 3 mi. W Swan Valley; Crane Creek, 15 mi. E Midvale; 1 mi. N Heath. Oregon (V. Bailey, 1936: 186): *Blue Mountain section*; Sheep Creek, Wenaha Forest. Washington: College Place (18488 KU). Idaho: Cedar Mtn. (Davis, 1939:290). Washington: Spokane Bridge; Duly Lake (Dalquest, 1948:332); Conconully (*ibid.*). British Columbia (Cowan and Guiguet, 1956:180): Osoyoos; Princeton; Lytton; Lillooet; Chezacut Lake; Anahim Lake.

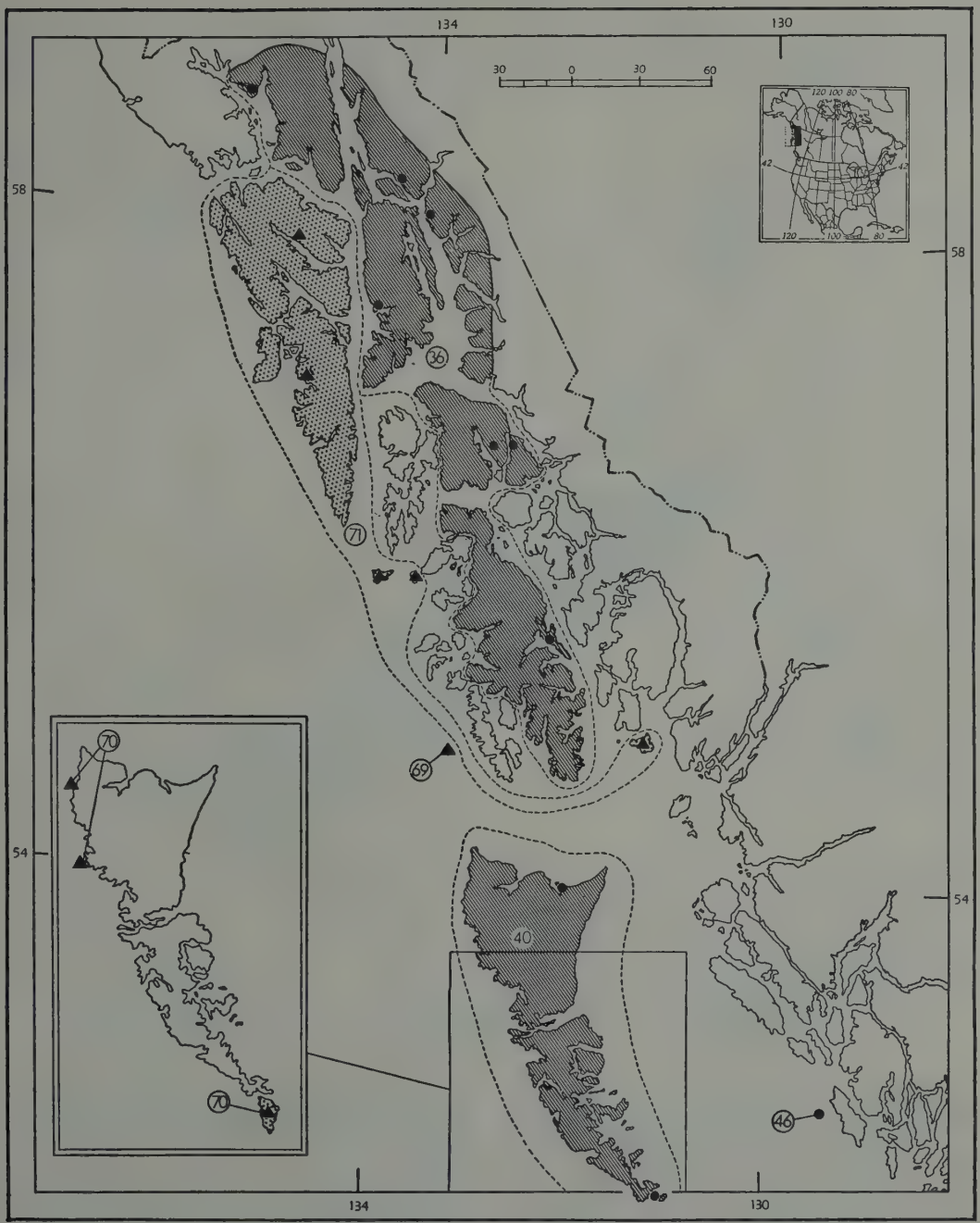
Peromyscus maniculatus assimilis Nelson and Goldman

1931. *Peromyscus maniculatus assimilis* Nelson and Goldman, Jour. Mamm., 12:305, August 24, type from Coronadas Island, Baja California. Known only from the type locality.

Peromyscus maniculatus austerus (Baird)

1855. *Hesperomys austerus* Baird, Proc. Acad. Nat. Sci. Philadelphia, 7:336, April, type from Old Fort Steilacoom, Pierce Co., Washington.
1909. *Peromyscus maniculatus austerus*, Osgood, N. Amer. Fauna, 28:63, April 17.
1899. *Peromyscus akeleyi* Elliot, Field Columb. Mus., Publ. 30, Zool. Ser., 1:226, February 2, type from Johnsons Ranch, Elwah River, Olympic Mts., Clallam Co., Washington.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:180): Loughborough Inlet; Vancouver; Agassiz. Washington (Dalquest, 1948:331): *Arlington*; Fall City; Vancouver; mouth Klama River; Tenino; 4 mi. N Shelton; Port Angeles, thence along coast to point of beginning.



Map 358. *Peromyscus maniculatus* (part) and *Peromyscus sitkensis*.

36. *P. maniculatus hylaeus*
40. *P. maniculatus keeni*
46. *P. maniculatus maritimus*
69. *P. sitkensis oceanicus*
70. *P. sitkensis prevostensis*
71. *P. sitkensis sitkensis*

Map 359. Some subspecies of *Peromyscus maniculatus*.

Guide to subspecies

5. *P. maniculatus angustus*
12. *P. maniculatus balaclavae*
13. *P. maniculatus beresfordi*
16. *P. maniculatus cancrivorus*
17. *P. maniculatus carli*
23. *P. maniculatus doylei*
31. *P. maniculatus georgiensis*
34. *P. maniculatus hollisteri*
38. *P. maniculatus interdictus*
39. *P. maniculatus isolatus*
46. *P. maniculatus maritimus*
54. *P. maniculatus pluvialis*
56. *P. maniculatus rubriventer*
60. *P. maniculatus sartinensis*
61. *P. maniculatus saturatus*
62. *P. maniculatus saxamans*
66. *P. maniculatus triangularis*

Peromyscus maniculatus bairdii (Hoy and Kennicott)

1857. *Mus bairdii* Hoy and Kennicott, *in* Kennicott, Agricultural Report, U. S. Commissioner Patents, 1856, p. 92, type from Bloomington, McLean Co., Illinois.

1909. *Peromyscus maniculatus bairdi*, Osgood, N. Amer. Fauna, 28:79, April 17.

MARGINAL RECORDS.—Manitoba (Soper, 1946:145): S end Lake Manitoba; Stony Mtn.; *Red River Valley at Winnipeg*. North Dakota: Pembina (V. Bailey, 1927:76). Minnesota: Otter Tail County. Wisconsin: Foster Twp., Clark County (Schmidt, 1931:115). Michigan (Burt, 1946: 206): Menominee County; Emmet County; Huron County. Ontario: London (Soper, 1923:247). New York: Elba (Moulthrop, 1938:503). Pennsylvania: Meadville (Mitchell, 1934:71). New York: Ithaca (Stickel, 1951:25). Pennsylvania: vicinity Wyalusing (Grimm and Whitebread, 1952:62); Schuylkill County (Roberts and Early, 1952:51); York County (Gifford and Whitebread, 1951:58). Maryland: 1⅘10 mi. N Bowie (Stickel, 1951:25). West Virginia:

Avalon (Hamilton, 1943:270). Tennessee (Kellogg, 1939: 278): La Follette; Hickory Withe. Arkansas (Sealander, 1956:274): Forrest City; Pine Bluff. Missouri: Carthage (Osgood, 1909:82). Kansas (Cockrum, 1952:175–176): Arkansas City; 8 mi. N, 1 mi. E Haven; 2½ mi. S Wilson; 3½ mi. W, ½ mi. S Beloit. Nebraska (Osgood, 1909:82): Grand Island; Ewing. North Dakota (V. Bailey, 1927a:76): Linton; Kenmare. Manitoba: Oak Lake (Soper, 1946:145). Note: The geographic ranges of *P. m. bairdii* and *P. m. gracilis* overlap, but are ecologically separated, in the northern part of the Lower Peninsula of Michigan; the geographic ranges of *P. m. bairdii* and *P. m. nubiterrae* overlap, but are ecologically separated, in Pennsylvania.

Peromyscus maniculatus balaclavae McCabe and Cowan

1945. *Peromyscus maniculatus balaclavae*, McCabe and Cowan, Trans. Royal Canadian Inst., 25:197, February, type from Balaclava Island, British Columbia. Known from Hope and Balaclava islands, British Columbia.

Peromyscus maniculatus beresfordi Guiguet

1955. *Peromyscus maniculatus beresfordi* Guiguet, Rept. Provincial Mus. Nat. Hist. and Anthro., British Columbia, for 1954, p. B71, August 1, type from Beresford Island, British Columbia. Known only from Beresford Island.

Peromyscus maniculatus blandus Osgood

1904. *Peromyscus sonoriensis blandus* Osgood, Proc. Biol. Soc. Washington, 17:56, March 21, type from Escalón, Chihuahua.
1909. *Peromyscus maniculatus blandus* Osgood, N. Amer. Fauna, 28:84, April 17.

MARGINAL RECORDS (Osgood, 1909:85–86, unless otherwise noted).—New Mexico: Tularosa; Carlsbad (V. Bailey, 1932:148). Texas: Toyahvale; Maxon Spring. Coahuila: Campo Centrale, 5300 ft., Sierra del Carmen, 30 mi. S Boquillas (Baker, 1956:264). Nuevo León: Horsetail Falls, near Monterrey (Booth, 1957:13). Tamaulipas: Miquihuana. San Luis Potosí: Santa María del Río (Dalquest, 1953:137). Jalisco: Lagos. Zacatecas: Plateado; Berriozábal; Cañitas. Durango: San Gabriel; Indé; Rosario. Chihuahua: Chihuahua; 20 km. N Galeana, 7000 ft. (Hooper, 1947:50). Arizona: E of Portal (Cahalane, 1939: 433). New Mexico: Deming; *White Sands* (Dice and Bradley, 1942:417).

Peromyscus maniculatus borealis Mearns

1890. *Hesperomys leucopus arcticus* Mearns, Bull. Amer. Mus. Nat. Hist., 2:285, February 21, type from Fort Simpson, Mackenzie, N. W. T. Not *Hesperomys arcticus* Coues, 1877 [= *Hesperomys maniculatus* Wagner], type locality, Labrador.
1911. *Peromyscus maniculatus borealis* Mearns, Proc. Biol. Soc. Washington, 24:102, May 15, a renaming of *arcticus* Mearns.

MARGINAL RECORDS (Osgood, 1909:51, unless otherwise noted).—Mackenzie: Fort Good Hope (Anderson, 1947: 138); Fort Rae; Fort Reliance (Banfield, 1951:117). Alberta: Chipewyan (Harper, 1932:28). Manitoba: vicinity Cormorant Lake, Mile 42 from The Pas, Churchill Railroad (Breckenridge, 1936:62). Saskatchewan: Indian Head. Alberta: Crows Nest Pass. British Columbia: Nukko Lake (Cowan and Guiguet, 1956:181); Sinkut Mtn. (*ibid.*); Hazelton (*ibid.*); Glenora (*ibid.*); Sheslay River. Yukon: Lake Marsh; White Horse Rapids; Lewes River; Fifty Mile River.

Peromyscus maniculatus cancrivorus McCabe and Cowan

1945. *Peromyscus maniculatus cancrivorus* McCabe and Cowan, Trans. Royal Canadian Inst., 25:195, February, type from Table Island, Queen Charlotte Sound, British Columbia. Known only from the type locality.

Peromyscus maniculatus carli Guiguet

1955. *Peromyscus maniculatus carli* Guiguet, Rept. Provincial Mus. Nat. Hist. and Anthro., British Columbia, for 1954, p. B72, August 1, type from Cox Island, British Columbia.

MARGINAL RECORDS.—Lanz Island (Guiguet, 1955: B73); type locality.

Peromyscus maniculatus catalinae Elliot

1903. *Peromyscus catalinae* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3(10):160, May 7, type from near Avalon, Santa Catalina Island, Santa Barbara Islands, Los Angeles Co., California. Known only from Santa Catalina Island.
1909. *Peromyscus maniculatus catalinae*, Osgood, N. Amer. Fauna, 28:97, April 17.

Peromyscus maniculatus cineritius J. A. Allen

1898. *Peromyscus cineritius* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:155, April 12, type from San Roque Island, Baja California. Known only from the type locality.
1909. *Peromyscus maniculatus cineritius*, Osgood, N. Amer. Fauna, 28:100, April 17.

Peromyscus maniculatus clementis Mearns

1896. *Peromyscus texanus clementis* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 4, March 25 (preprint of Proc. U. S. Nat. Mus., 18:446, May 23, 1896), type from Pyramid Cove, SE end San Clemente Island, Santa Barbara Islands, California. Known only from San Clemente Island.
1909. *Peromyscus maniculatus clementis*, Osgood, N. Amer. Fauna, 28:96, April 17.

Peromyscus maniculatus coolidgei Thomas

1898. *Peromyscus leucopus coolidgei* Thomas, Ann. Mag. Nat. Hist., ser. 7, 1:45, January, type from Santa Anita, cape region of Baja California.
1909. *Peromyscus maniculatus coolidgei*, Osgood, N. Amer. Fauna, 28:94, April 17.

MARGINAL RECORDS (Osgood, 1909:95).—Baja California: Rosario; San Francisquito, thence southward to the tip of the peninsula, excepting the area occupied by *P. m. magdalenae*.

Peromyscus maniculatus dorsalis Nelson and Goldman

1931. *Peromyscus maniculatus dorsalis* Nelson and Goldman, Jour. Washington Acad. Sci., 21:535, December 19, type from Natividad Island, Baja California. Known only from the type locality.

Peromyscus maniculatus doylei McCabe and Cowan

1945. *Peromyscus maniculatus doylei* McCabe and Cowan, Trans. Royal Canadian Inst., 25:196, February, type from Doyle Island, Gordon Group, British Columbia. Known only from the type locality.

Peromyscus maniculatus dubius J. A. Allen

1898. *Peromyscus dubius* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:157, April 12, type from Todos Santos Island, Baja California. Known only from the type locality.
1909. *Peromyscus maniculatus dubius,* Osgood, N. Amer. Fauna, 28:98, April 17.

Peromyscus maniculatus elusus Nelson and Goldman

1931. *Peromyscus maniculatus elusus* Nelson and Goldman, Jour. Washington Acad. Sci., 21:533, December 19, type from Santa Barbara Island, Ventura Co., California. Known only from the type locality.

Peromyscus maniculatus eremus Osgood

1909. *Peromyscus maniculatus eremus* Osgood, N. Amer. Fauna, 28:47, April 17, type from Pleasant Bay, Grindstone Island, Magdalen Islands, Quebec. Known only from Grindstone Island.

Peromyscus maniculatus exiguus J. A. Allen

1898. *Peromyscus exiguus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:157, April 12, type from San Martín Island, Baja California. Known only from San Martín Island.
1955. *Peromyscus maniculatus exiguus,* Miller and Kellogg, Bull. U. S. Nat. Mus., 205:485, March 3.
1931. *Peromyscus maniculatus martinensis* Nelson and Goldman, Jour. Washington Acad. Sci., 21:534, December 19, type from San Martín Island, Baja California.

Peromyscus maniculatus exterus Nelson and Goldman

1931. *Peromyscus maniculatus exterus* Nelson and Goldman, Jour. Washington Acad. Sci., 21:532, December 19, type from San Nicolas Island, Santa Barbara Co., California. Known only from the type locality.

Peromyscus maniculatus fulvus Osgood

1904. *Peromyscus sonoriensis fulvus* Osgood, Proc. Biol. Soc. Washington, 17:57, March 21, type from city of Oaxaca, Oaxaca.
1909. *Peromyscus maniculatus fulvus* Osgood, N. Amer. Fauna, 28:86, April 17.

MARGINAL RECORDS (Osgood, 1909:87, unless otherwise noted).—Veracruz: Xuchil; Las Vigas. Oaxaca: type locality; Huajuapan. México: Zempoala, 3200 m. (Hooper, 1947:50). Distrito Federal (Villa, 1953:419): rancho La Noria, 1 mi. W Xochimilco, 2270 m.; *1 km. S San Mateo Xalpa, 2700 m.* Morelos: 5 mi. W Tepozlan [= Tepoztlán] (Davis and Russell, 1954:75). México: 23 km. E México City (Villa, 1953:421). Hidalgo: Pachuca.

Peromyscus maniculatus gambelii (Baird)

1858. *Hesperomys gambelii* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):464, July 14, type from Monterey, Monterey Co., California.
1909. *Peromyscus maniculatus gambeli,* Osgood, N. Amer. Fauna, 28:67, April 17.
1893. *Sitomys americanus thurberi* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:185, August 18, type from Sierra San Pedro Mártir, Baja California.
1896. *Peromyscus texanus medius* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 4, March 25 (preprint of Proc. U. S. Nat. Mus., 18:446, May 23, 1896), type from Nachoguero Valley, Baja California.

MARGINAL RECORDS.—Washington (Dalquest, 1948:332): Chelan; 5 mi. N Coulee; Sprague; Steptoe Butte. Oregon (Osgood, 1909:72): Pendleton; Burns; Lake Alvord. Nevada (Hall, 1946:515): 5 mi. N Summit Lake, 5900 ft.; 10½ mi. W, 6 mi. N Sulphur, 4000 ft.; *Fox Canyon, 6 mi. S Pahrum Peak, 4800 ft.; Sutcliffe, Pyramid Lake; 8 mi. NE Reno;* 3 mi. E Reno. California (Osgood, 1909:70–71): Donner; *Emerald Bay, Lake Tahoe;* Sonora Pass; Mt. Dana; head of San Joaquin River; Giant Forest, Sequoia National Forest; Orris; Buttonwillow; Riverside; Laguna Mts., San Diego Co.; Jacumba. Baja California (Osgood, 1909:71): Piñon; Santa Rosa; San Felipe; Santa Eulalia; San Quentín [*sic*], thence up coast to California (Osgood, 1909:71): Santa Cruz; *San Antonio;* Petaluma; Mt. St. Helena; Mt. Sanhedrin; Mad River, Trinity Co.; Hoopa Valley; *Horse Creek.* Oregon (Osgood, 1909:72): Diamond Lake; Bend; Detroit; Mt. Hood. Washington (Dalquest, 1948:332): Lyle; Cle Elum; Leavenworth.

Peromyscus maniculatus georgiensis Hall

1938. *Peromyscus maniculatus georgiensis* Hall, Amer. Nat., 72:455, September 10, type from Vananda, Texada Island, Georgia Strait, British Columbia.

MARGINAL RECORDS (Hall, 1938:455).—British Columbia: Savary Island; type locality; Thormanby Island; Bowen Island; Lasqueti Island.

Peromyscus maniculatus geronimensis J. A. Allen

1898. *Peromyscus geronimensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:156, April 12, type from San Gerónimo Island, Baja California. Known only from the type locality.
1909. *Peromyscus maniculatus geronimensis,* Osgood, N. Amer. Fauna, 28:99, April 17.

Peromyscus maniculatus gracilis (Le Conte)

1855. *H[esperomys]. gracilis* Le Conte, Proc. Acad. Nat. Sci. Philadelphia, 7:442, type from Michigan.
1909. *Peromyscus maniculatus gracilis,* Osgood, N. Amer. Fauna, 28:42, April 17.
1893. *Sitomys americanus canadensis* Miller, Proc. Biol. Soc. Washington, 8:55, June 20, type from Peterboro, Madison Co., New York.

MARGINAL RECORDS.—Quebec: Godbout (Anderson, 1947:139). New Hampshire: 4 mi. S Center Ossipee (8582 KU). Connecticut: Pomfret, near Hampton line (9757 KU). Pennsylvania (Grimm and Whitebread, 1952: 62): Monroe County; Carbon County; Sullivan County. New York: vicinity Ithaca (Hamilton, 1950:100); Allegany State Park (Schoonmaker, 1929:248). Ontario: Port Franks (Anderson, 1947:139). Michigan (Burt, 1946:206, 208): Missaukee County; South Manitou Island; Menominee County. Wisconsin: Thorp Township, Clark Co. (Schmidt, 1931:115). Minnesota: Lake Itasca Forestry and Biological Station (Hatfield, 1938:207); Tower (Osgood, 1909:44). Ontario: Michipicoten Island, Lake Superior (Osgood, 1909: 45). Quebec: upper part valley of Gatineau (Anderson, 1940:68).

Peromyscus maniculatus hollisteri Osgood

1909. *Peromyscus maniculatus hollisteri* Osgood, N. Amer. Fauna, 28:62, April 17, type from Friday Harbor, San Juan Island, San Juan Co., Washington.

MARGINAL RECORDS (Dalquest, 1948:330).—Washington: Cypress Island; Blakeley Island; type locality.

Peromyscus maniculatus hueyi Nelson and Goldman

1932. *Peromyscus maniculatus hueyi* Nelson and Goldman, Trans. San Diego Soc. Nat. Hist., 7:51, April 15, type from small island in Gonzaga Bay, lat. about 29° 50′, Baja California. Known only from the type locality.

Peromyscus maniculatus hylaeus Osgood

1908. *Peromyscus hylaeus* Osgood, Proc. Biol. Soc. Washington, 21:141, June 9, type from Hollis, Kasaan Bay, Prince of Wales Island, Alaska.
1909. *Peromyscus maniculatus hylaeus* Osgood, N. Amer. Fauna, 28:53, April 17.

MARGINAL RECORDS (Osgood, 1909:54).—Alaska: Glacier Bay; Juneau; Taku Harbor; Petersburg, Mitkof Island; type locality; Lindenburg Peninsula, Kupreanof Island; near Killisnoo, Admiralty Island.

Peromyscus maniculatus inclarus Goldman

1939. *Peromyscus maniculatus inclarus* Goldman, Jour. Mamm., 20:355, August 14, type from Fremont Island, 4250 ft., Great Salt Lake, Weber Co., Utah. Known only from Fremont Island.

Peromyscus maniculatus interdictus Anderson

1932. *Peromyscus maniculatus interdictus* Anderson, Bull. Nat. Mus. Canada, 70:110, November 24, type from Forbidden Plateau, near E edge Strathcona Park, N of Mt. Albert Edward, about 17 mi. W Comox, 4200 ft., Vancouver Island, British Columbia.

MARGINAL RECORDS.—British Columbia (Vancouver Island): type locality; Nootka Sound (Anderson, 1947:139), and northward throughout Vancouver Island.

Peromyscus maniculatus isolatus Cowan

1935. *Peromyscus sitkensis isolatus* Cowan, Univ. California Publ. Zool., 40:434, November 14, type from Pine Island, Queen Charlotte Sound, N end Vancouver Island, British Columbia.
1945. *Peromyscus maniculatus isolatus*, McCabe and Cowan, Trans. Royal Canadian Inst., 25:194, February.

MARGINAL RECORDS.—British Columbia: type locality; Nigei Island (McCabe and Cowan, 1945:194).

Peromyscus maniculatus keeni (Rhoads)

1894. *Sitomys keeni* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:258, October, type from Massett, Graham Island, Queen Charlotte Islands, British Columbia.
1909. *Peromyscus maniculatus keeni*, Osgood, N. Amer. Fauna, 28:55, April 17.

MARGINAL RECORDS.—British Columbia: type locality; near Rose Harbor, Moresby Island (Osgood, 1909:55).

Peromyscus maniculatus labecula Elliot

1903. *Peromyscus labecula* Elliot, Field Columb. Mus., Publ. 71, Zool. Ser., 3(8):143, March 20, type from Ocotlán, Jalisco.
1909. *Peromyscus maniculatus labecula*, Osgood, N. Amer. Fauna, 28:87, April 17.

MARGINAL RECORDS (Osgood, 1909:88–89, unless otherwise noted).—Zacatecas: Sierra de Valparaíso; Zacatecas. Guanajuato: Santa Rosa. Hidalgo: Zimapán; Ixmiquilpan. Distrito Federal: Cerro de Santa Isabel, 8 km. N México, 2340 m. (Villa, 1953:421). México: 4 km. ESE San Rafael, 2460 m. (*op. cit.*:422). Puebla: Río Otlati, 15 km. NW San Martín, 8700 ft. (Davis, 1944:395). Morelos (Davis and Russell, 1954:75): *1½ mi. SE Huitzilac; 2 mi. W Huitzilac; 5 km. N Tres Cumbres.* Distrito Federal (Villa, 1953:421–422): *rancho La Noria, 1 mi. W Xochimilco, 2270 m.; ¾ mi. SSE San Andrés, 2620 m.; La Venta, 2780 m.* México: 6 mi. NNW Acambay (Hooper, 1955:14). Jalisco: ½ mi. NW, 1½ mi. N Mazamitla (Hooper, 1955:14). Colima: Hda. Magdalena. Jalisco: Mascota. Nayarit: Ojo de Aguas, near Amatlán.

Peromyscus maniculatus macrorhinus (Rhoads)

1894. *Sitomys macrorhinus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:259, October, type from mouth of Skeena River, British Columbia.
1909. *Peromyscus maniculatus macrorhinus*, Osgood, N. Amer. Fauna, 28:57, April 17.

MARGINAL RECORDS (Cowan and Guiguet, 1956: 187, unless otherwise noted).—British Columbia: Docdaon Creek; W end Eutsuk Lake; Stuie; Kingcome Inlet; also the following islands: Calvert, *King, Swindle, Aristazabal, Princess Royal, North Estevan, Banks, Pitt, McCauley,* and *Porcher.* Alaska: Metlakatla; Woronkofski Island.

Peromyscus maniculatus magdalenae Osgood

1909. *Peromyscus maniculatus magdalenae* Osgood, N. Amer. Fauna, 28:101, April 17, type from Magdalena Island, Baja California.

MARGINAL RECORDS (Osgood, 1909:101).—Baja California: San Juanico Bay; Matancita; type locality.

Peromyscus maniculatus maniculatus (Wagner)

1845. *Hesperomys maniculatus* Wagner, Arch. Naturgesch., Jahrg. 11, 1:148. Type locality, the Moravian settlements in Labrador.
1898. *Peromyscus maniculatus,* Bangs, Amer. Nat., 32:496, July.
1877. [*Hesperomys*] *arcticus* Coues, *in* Coues and Allen, Monogr. N. Amer. Rodentia, pp. 61 and 67, a *nomen nudum.*
1877. [*Hesperomys*] *bairdii* Coues, *in* Coues and Allen, Monogr. N. Amer. Rodentia, pp. 61 and 67. Type locality, Labrador. Not *Mus bairdii* Hoy and Kennicott, 1857 [= *Peromyscus maniculatus bairdii*], type from Bloomington, McLean Co., Illinois.
1897. *Peromyscus canadensis umbrinus* Miller, Proc. Boston Soc. Nat. Hist., 28:23, April 30, type from Peninsula Harbor, north shore Lake Superior, Ontario.

MARGINAL RECORDS (Osgood, 1909:42, unless otherwise noted).—Quebec: Port Burwell (Cameron and Morris, 1951:127); Natashquan (Weaver, 1940:419). Ontario: Lowbush, Lake Abitibi (10343 KU). Michigan: Isle Royale (Burt, 1946:208). Manitoba: Marchand (Soper, 1946:145); Norway House; York Factory. Quebec: Great Whale River.

Peromyscus maniculatus margaritae Osgood

1909. *Peromyscus maniculatus margaritae* Osgood, N. Amer. Fauna, 28:95, April 17, type from Margarita Island, Baja California. Known only from the type locality.

Peromyscus maniculatus maritimus McCabe and Cowan

1945. *Peromyscus maniculatus maritimus* McCabe and Cowan, Trans. Royal Canadian Inst., 25:199, February, type from largest of Moore Islands, British Columbia. Known only from the type locality.

Peromyscus maniculatus nebrascensis (Coues)

1877. *Hesperomys sonoriensis* var. *nebrascensis* Coues, *in* Coues and Allen, Monogr. N. Amer. Rodentia, p. 79, type from Deer Creek, Nebraska.
1911. *Peromyscus maniculatus nebrascensis,* Mearns, Proc. Biol. Soc. Washington, 24:102, May 15.
1905. *Peromyscus luteus* Osgood, Proc. Biol. Soc. Washington, 18:77, February 21, type from Kennedy, Cherry Co., Nebraska.

MARGINAL RECORDS (Osgood, 1909:79, unless otherwise noted).—North Dakota: Medora; Dickinson. Nebraska: Valentine; Broken Bow. Kansas (Cockrum, 1952:174): ½ mi. W Downs; 3 mi. N, 2 mi. W Hoisington; 1 mi. N Harper. Oklahoma (Blair, 1939:119): Enid; Norman; Chattanooga; Buck Creek; Tesquite Canyon. Kansas: Cimarron River, NW Rolla (Cockrum, 1952:174). Colorado: 1 mi. E Laird (51611 KU). Wyoming: eastern Niobrara County (Quay, 1948:181). South Dakota: Elk Mountain; Custer?

Peromyscus maniculatus nubiterrae Rhoads

1896. *Peromyscus leucopus nubiterrae* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 48:187, April, type from summit Roan Mtn., 6370 ft., Mitchell Co., North Carolina.
1909. *Peromyscus maniculatus nubiterrae,* Osgood, N. Amer. Fauna, 28:47, April 17.

MARGINAL RECORDS (Osgood, 1909:48, unless otherwise noted).—New York: Allegany County (Hamilton, 1943:270). Pennsylvania: Bradford County (Roslund, 1951:45); Sullivan County (*ibid.*); Mifflin County (Gifford and Whitebread, 1951:58). Virginia: Skyland; Bedford County (Handley and Patton, 1947:161); Mt. Rogers. South Carolina: near Caesar's Head (Coleman, 1948:294). Georgia: Brasstown Bald. Kentucky: Rosspoint, 1250 ft. (Barbour, 1941:195). West Virginia: Cold Knob Mts.; Morgantown (Wilson, 1945:95). Pennsylvania: Fayette County (Grimm and Roberts, 1950:69); Westmoreland County (*ibid.*); Port Allegany (Hamilton, 1943:270). Note: In central Pennsylvania, *P. m. nubiterrae* and *P. m. bairdii* both occur. They are ecologically separated, however, *P. m. nubiterrae* occurring at higher elevations and *P. m. bairdii* generally in the valleys.

Peromyscus maniculatus oreas Bangs

1898. *Peromyscus oreas* Bangs, Proc. Biol. Soc. Washington, 12:84, March 24, type from Mount Baker Range, 6500 ft., British Columbia, near boundary of Whatcom County, Washington.
1909. *Peromyscus maniculatus oreas,* Osgood, N. Amer. Fauna, 28:51, April 17.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:187–188): Owikeno Lake; Lillooet; Allison Pass. Washington (Dalquest, 1948:330): Tomyhoi Lake; Grouse Creek; Windriver C.C.C. Camp; Yacolt; North Bend. British Columbia (Cowan and Guiguet, 1956:187–188): *Mt. Seymour; Lihumitson Park*; Hope; Cypress Lake; Alta Lake; *head Bute Inlet*; head Loughborough Inlet. Also in western Washington: Soleduk Hot Springs (10714 KU); Deer Park (Dalquest, 1948:330); Lake Cushman (*ibid.*); Kelso (*ibid.*), thence along coast to point of beginning.

Peromyscus maniculatus osgoodi Mearns

1890. *Hesperomys leucopus nebrascensis* Mearns, Bull. Amer. Mus. Nat. Hist., 2:285 (described on page 287), February 21, type from Calf Creek, Custer Co., Montana. Not *Hesperomys sonoriensis* var. *nebrascensis* Coues, 1877, type from Deer Creek, Nebraska.
1911. *Peromyscus maniculatus osgoodi* Mearns, Proc. Biol. Soc. Washington, 24:102, May 15, a renaming of *nebrascensis* Mearns.

MARGINAL RECORDS (Osgood, 1909:76–77, unless otherwise noted).—Saskatchewan: Moosejaw; Glen Ewen (Soper, 1946:146); Estevan (*ibid.*). North Dakota: Bismark (*ibid.*); Sioux County (Telford, 1943:400); Taylor (Clark, 1936:44); Fort Buford. Montana: Powderville. South Dakota: Belle Fourche; Smithville; Buffalo Cap. Nebraska (Jones, 1954:485): 3 mi. E Chadron; *Chadron State Park*; Agate. Colorado (Warren, 1942:202): Wray; Gaume Ranch. Texas: Washburn (*ibid.*). Oklahoma: Kenton (Blair, 1939:119). Colorado (Warren, 1942:202): Divide; Valmont. Wyoming: Lake Fork. Colorado: near Craig; Steamboat Springs (Warren, 1942:202); Yarmany Creek (*ibid.*); Yampa (*ibid.*); Buford (*ibid.*); Grand Junction (*ibid.*). Utah (Durrant, 1952:316): 1 mi. N Moab Bridge, 3395 ft.; Willow Creek, 29 mi. S Ouray, 5400 ft.; Red Creek, 2 mi. N Fruitland, 6700 ft.; Ashley Creek, 10 (air line) mi. NW Vernal. Colorado: Ladore (Warren, 1942:202). Utah: Hideout Canyon, Ashley National Forest (Kelson, 1951:85); *Sheep Creek, 7 mi. S Manila* (Durrant, 1952:163); Henrys Park, Henrys Fork (*ibid.*). Wyoming: Fort Bridger; Fon-

tanelle; Clarks Fork. Montana: Jefferson River; St. Mary Lake (Dice and Bradley, 1942:417). Alberta: McDonald Lake (Soper, 1946:146). Saskatchewan: Crane Lake.

Peromyscus maniculatus ozarkiarum Black

1935. *Peromyscus maniculatus ozarkiarum* Black, Jour. Mamm., 16:144, May 15, type from 3 mi. S Winslow, Washington Co., Arkansas.

MARGINAL RECORDS.—Arkansas (Black, 1936:33, unless otherwise indicated): Gravette; Huntsville; Mena (Sealander, 1956:274). Oklahoma: 2 mi. NW Stapp, 1 mi. NE Zoe (Blair, 1939:119). Texas (Russell, 1953:460): Gainesville; *Willow Creek, 6 mi. SW Gainesville; 2 mi. S Marysville.* Oklahoma (Blair, 1939:119): 10 mi. SW Norman; Stillwater; Garnett.

Peromyscus maniculatus pallescens J. A. Allen

1896. *Peromyscus michiganensis pallescens* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 8:238, November 21, type from San Antonio, Bexar Co., Texas.
1909. *Peromyscus maniculatus pallescens,* Osgood, N. Amer. Fauna, 28:83, April 17.

MARGINAL RECORDS.—Oklahoma (McCarley, 1952: 107): 6 mi. NW Colbert; *5 mi. N Colbert.* Texas: Waco (Osgood, 1909:84); 2 mi. S Taylor (Blair, 1954:201); *Alice* (Osgood, 1909:84); 12 mi. SW Alice (Blair, 1952:242); about 4 mi. NE Rockport (Pettus, 1957:416); San Antonio (Blair, 1952:242); 3 mi. NE Bertram (Flury, 1949:199).

Peromyscus maniculatus plumbeus C. F. Jackson

1939. *Peromyscus maniculatus plumbeus* C. F. Jackson, Proc. Biol. Soc. Washington, 52:101, June 5, type from Pigou River, N shore Gulf of St. Lawrence, Saguenay Co., Quebec.

MARGINAL RECORDS.—Quebec: Bay of Seven Islands (Anderson, 1947:140); type locality.

Peromyscus maniculatus pluvialis McCabe and Cowan

1945. *Peromyscus maniculatus pluvialis* McCabe and Cowan, Trans. Royal Canadian Inst., 25:199, February, type from northern island, Goose Island Group, lat. 52° N, long 128° 31′ W, British Columbia. Known only from the type locality.

Peromyscus maniculatus rubidus Osgood

1901. *Peromyscus oreas rubidus* Osgood, Proc. Biol. Soc. Washington, 14:193, December 12, type from Mendocino City, Mendocino Co., California.
1909. *Peromyscus maniculatus rubidus* Osgood, N. Amer. Fauna, 28:65, April 17.
1903. *Peromyscus perimekurus,* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3(10):156, May 7, type from Goldbeach, Curry Co., Oregon.

MARGINAL RECORDS (Osgood, 1909:66–67, unless otherwise noted).—Washington: Puget Island (Dalquest, 1948:331). Oregon: W slope Mt. Hood; Wells; Prospect. California: Hoopa Valley; *Canyon Creek, Trinity Co.; Carlotta* (Dice and Bradley, 1942:417); near Calpella; Camp Meeker; *Olema;* La Honda.

Peromyscus maniculatus rubriventer McCabe and Cowan

1945. *Peromyscus maniculatus rubriventer* McCabe and Cowan, Trans. Royal Canadian Inst., 25:196, February, type from Ruth Island, Hunter Islands, British Columbia.

MARGINAL RECORDS (Anderson, 1947:141).—British Columbia: Chatfield Island; Hecate Island; Smythe Island.

Peromyscus maniculatus rufinus (Merriam)

1890. *Hesperomys leucopus rufinus* Merriam, N. Amer. Fauna, 3:65, September 11, type from San Francisco Mtn., 9000 ft., Coconino Co., Arizona.
1909. *Peromyscus maniculatus rufinus,* Osgood, N. Amer. Fauna, 28:72, April 17.

MARGINAL RECORDS (Warren, 1942:199–200, unless otherwise noted).—Northwestern segment: Utah (Durrant, 1952:312–313, unless otherwise noted): 5 mi. SW Laketown, 6500 ft.; *Monte Cristo, 18 mi. W Woodruff, 8000 ft.;* Chalk Creek, 19 mi. NE Coalville; Hoop Lake, Ashley National Forest, 8000 ft.; junction Deep and Carter creeks, 7900 ft.; *Beaver Creek, 19 mi. S Manila; Green Lake, 60 mi. N Vernal; junction Trout and Ashley creeks, 9700 ft.* (Kelson, 1951:84); *Petty Mtn., 15 mi. N Mountain Home, 9500 ft.*; Stockmore; *4 mi. E Mt. Alice, between Emery and Loa, 7450 ft.*; Elkhorn Guard Station, 14 mi. N Torrey, Fishlake Plateau, 9400 ft.; Fishlake, 8730 ft.; Maple Canyon; 1 mi. N Salt Lake City, 4500 ft.; Anderson's Ranch, 5700 ft., Blacksmiths Fork.

Southeastern segment: Colorado: Pearl; Estes Park; Boulder; Golden; Cañon City. New Mexico (Osgood, 1909:74, unless otherwise noted): Bear Canyon, Raton Range; Sierra Grande; Cabra Springs; Carrizozo; Cloudcroft (Dice and Bradley, 1942:417); 5 mi. E Tularosa; head of Mimbres River. Arizona (Osgood, 1909:74, unless otherwise noted): San Bernardino Ranch; Chiricahua Mts.; *NW slope Carr Peak, 8400 ft.* (Hoffmeister and Goodpaster, 1954:117); Columbine, Mt. Graham (Hatfield, 1942:155); Baker Butte; type locality; Keam Canyon. Utah (Durrant, 1952:313): *Noland Ranch*; Riverview; Hatch Trading Post, 25 mi. SE Blanding, Montezuma Creek, 4500 ft.; Duck Lake, 1 mi. S Gooseberry R. S., Elk Ridge, 8400 ft.; Moab; Castle Valley, 6000 ft., 18 mi. NE Moab. Colorado: Debeque; Rifle; Marvine Lodge; Toponas; *McCoy*; Sheephorn Pass; Elkhead Mts.

Peromyscus maniculatus sanctaerosae von Bloeker

1940. *Peromyscus maniculatus sanctaerosae* von Bloeker, Bull. California Acad. Sci., 39(pt. 2):173, December 15, type from Elderberry Canyon, Santa Rosa Island, Santa Barbara Co., California. Known only from Santa Rosa Island.

Peromyscus maniculatus santacruzae Nelson and Goldman

1931. *Peromyscus maniculatus santacruzae* Nelson and Goldman, Jour. Washington Acad. Sci., 21:532, December 19, type from Santa Cruz Island, Santa Barbara Co., California. Known only from the type locality.

Peromyscus maniculatus sartinensis Guiguet

1955. *Peromyscus maniculatus sartinensis* Guiguet, Rept. Provincial Mus. Nat. Hist. and Anthro., British Columbia, for 1954, p. B69, August 1, type from Sartine Island, British Columbia. Known only from Sartine Island.

Peromyscus maniculatus saturatus Bangs

1897. *Peromyscus texanus saturatus* Bangs, Amer. Nat., 31:75, January, type from Saturna Island, Gulf of Georgia, between Victoria and Vancouver City, British Columbia. Known only from Saturna Island.
1909. *Peromyscus maniculatus saturatus*, Osgood, N. Amer. Fauna, 28:61, April 17.

Peromyscus maniculatus saxamans McCabe and Cowan

1945. *Peromyscus maniculatus saxamans* McCabe and Cowan, Trans. Royal Canadian Inst., 25:198, February, type from Duncan Island, British Columbia.

MARGINAL RECORDS (Anderson, 1947:141).—British Columbia: Hurst Island; Heard Island; Bell Island; type locality.

Peromyscus maniculatus serratus Davis

1939. *Peromyscus maniculatus serratus* Davis, The Recent mammals of Idaho, p. 290, April 5, type from Mill Creek, 14 mi. W Challis, Custer Co., Idaho.

MARGINAL RECORDS (Davis, 1939:290).—Idaho: 5 mi. E Warm Lake; Alturas Lake; type locality.

Peromyscus maniculatus sonoriensis (Le Conte)

1853. *Hesp*[*eromys*]. *sonoriensis* Le Conte, Proc. Acad. Nat. Sci. Philadelphia, 6:413, type from Santa Cruz, Sonora.
1909. *Peromyscus maniculatus sonoriensis*, Osgood, N. Amer. Fauna, 28:89, April 17.
1890. *Hesperomys leucopus deserticolus* Mearns, Bull. Amer. Mus. Nat. Hist., 2:285 (described on p. 287), February 21, type from Mohave Desert, San Bernardino Co., California.
1894. *Sitomys insolatus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:256, October, type from Oro Grande, Mohave Desert, San Bernardino Co., California.
1903. *Peromyscus oresterus* Elliot, Field Columb. Mus., Publ. 74, Zool Ser., 3(10):159, May 7, type from Vallecitos, Sierra San Pedro Mártir, Baja California.
1937. *Peromyscus maniculatus gunnisoni* Goldman, Proc. Biol. Soc. Washington, 50:224, December 28, type from Gunnison Island, about 4300 ft., Great Salt Lake, Utah. Regarded as identical with *P. m. sonoriensis* by Durrant, Univ. Kansas Publ., Mus. Nat. Hist., 6:307, 310, August 10, 1952.

MARGINAL RECORDS (Osgood, 1909:92–94, unless otherwise noted).—Idaho (Davis, 1939:293): Lemhi; Birch Creek, Clark Co.; lava beds, 17 mi. W Idaho Falls; Crow Creek; Montpelier Creek. Utah (Durrant, 1952:310–311): Ogden, 4400 ft.; Salt Lake City; Provo; Nephi; Manti; *Glenwood*; Loa; 5 mi. S Castle Dale, 5600 ft.; Christensen Ranch, Nine-mile Canyon, 10 mi. E summit, 6300 ft.; 7 mi. N Greenriver, 4100 ft.; San Rafael River, 15 mi. SW Greenriver; Mt. Ellen, Henry Mts.; Soldier Spring, Navajo Mtn.; Johns Canyon, 5150 ft., San Juan River; ½ mi. NW Bluff. Arizona: Holbrook; *Painted Desert*; Kaibab Plateau (Rasmussen, 1941:272); Phoenix; Oracle; Dos Cabesos; Huachuca Mts. Sonora: Cienega Well; *opposite mouth Hardy River*. Baja California: La Grulla; Hanson Lagoon. California: Vallecito; Lytle Creek; Mt. Piños; Painted Rock, SE Simmler; Bakersfield; Kernville; Mt. Whitney; Mammoth; *Independence Creek; Leavett Meadows*; Markleeville. Nevada (Hall, 1946:516): *Zephyr Cove*; 3 mi. S Mt. Rose; 34 mi. E Reno; ½ mi. S Pyramid Lake; 30 mi. W, 4 mi. N Lovelock, 4300 ft.; 1¼ mi. N Sulphur, 4050 ft.; 1 mi. S Denio, Oregon, 4200 ft. Oregon: S shore Malheur Lake (V. Bailey, 1936:185). Idaho (Davis, 1939:293): Nampa; Craters of the Moon National Monument.

Peromyscus maniculatus streatori Nelson and Goldman

1931. *Peromyscus maniculatus streatori* Nelson and Goldman, Jour. Washington Acad. Sci., 21:531, December 19, type from San Miguel Island, Santa Barbara Co., California. Known only from the type locality.

Peromyscus maniculatus triangularis Guiguet

1955. *Peromyscus maniculatus triangularis* Guiguet, Rept. Provincial Mus. Nat. Hist. and Anthro., British Columbia, for 1954, p. B69, August 1, type from Triangle Island, Known only from Triangle Island.

Peromyscus sejugis Burt
Santa Cruz Island Mouse

1932. *Peromyscus sejugis* Burt, Trans. San Diego Soc. Nat. Hist., 7:171, October 31, type from Santa Cruz Island, lat. 25° 17′ N, long. 110° 43′ W, Gulf of California, Baja California. Confined, so far as known, to Santa Cruz Island and San Diego Island (25° 12′ N, 110° 42′ W), Gulf of California.

Color of upper parts grayish washed with avellaneous, giving general dull color to upper parts; underparts white; tail distinctly bicolor with narrow dorsal stripe (about 1.5 mm. wide in dry skin); ears distinctly dusky. Skull arched anteroposteriorly; rostrum heavy; nasals broad, tapering posteriorly and terminating beyond premaxillae; audital bullae relatively small; length of shelf of bony palate greater than length of maxillary tooth-row (after Burt, 1932:171). Average measurements of 24 topotypes are: 173; 85; 22; 16.

Peromyscus slevini Mailliard
Slevin's Mouse

1924. *Peromyscus slevini* Mailliard, Proc. California Acad. Sci., ser. 4, 12:1221, July 22, type from Santa Catalina Island, 17 mi. NE Punta San Marcial, Gulf of California, Baja California. Known only from Santa Catalina Island, Baja California.

External measurements of the type, an adult male, are: 225; 120; 27; ear (dry), 16.5. Upper parts (worn pelage) pale cinnamon with admixture of dusky hairs dorsally; underparts white with pale wash of cinnamon pectorally; feet creamy white; forelegs pale cinnamon; tail bicolor, darker than dorsum of body above, almost white below. Skull with interparietal rhomboidal; nasals extending markedly posterior to premaxillary tongues.

Peromyscus sitkensis
Sitka Mouse

External measurements: 205–230; 97–116; 25–27; ear (dry), 14.4–17.8. Upper parts rich russet to mars brown, shading to darker dorsally; underparts white or almost so; dusky tones well developed on face, forelegs, and ankles; tail bicolored. Skull much as in *P. maniculatus*, but larger, more robust; nasals and rostrum relatively longer; auditory bullae relatively smaller.

Peromyscus sitkensis has a peculiarly disrupted distribution. Not only does it occur only on islands, but in some cases on islands some distance from each other with intervening islands occupied by *P. maniculatus*. The two species, *P. maniculatus* and *P. sitkensis*, are closely related and are not known to occur on the same island. In spite of its larger size, *P. sitkensis* is distributionally the weaker species.

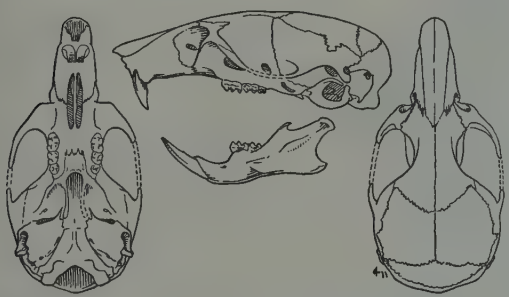


Fig. 346. *Peromyscus sitkensis sitkensis*, Sitka, Alaska, No. 433 K.U., ♂, X 1½.

Peromyscus sitkensis oceanicus Cowan

1935. *Peromyscus sitkensis oceanicus* Cowan, Univ. California Publ. Zool., 40:432, November 14, type from Forrester Island, Alaska. Known only from the type locality.

Peromyscus sitkensis prevostensis Osgood

1901. *Peromyscus prevostensis* Osgood, N. Amer. Fauna, 21:29, September 26, type from Prevost Island, Queen Charlotte Group, British Columbia.

1909. *Peromyscus sitkensis prevostensis* Osgood, N. Amer. Fauna, 28:102, April 17.

MARGINAL RECORDS (Cowan and Guiguet, 1956: 190).—British Columbia: Frederick Island; type locality; Hippa Island.

Peromyscus sitkensis sitkensis Merriam

1897. *Peromyscus sitkensis* Merriam, Proc. Biol. Soc. Washington, 11:223, July 15, type from Sitka, Alaska.

MARGINAL RECORDS (Cowan, 1935:432).—Alaska: Chichagof Island; Warren Island; Duke Island; Coronation Island; Baranof Island.

Peromyscus polionotus
Oldfield Mouse

External measurements: 122–153; 40–60; 15–19; ear (dry), 11.6–16.5. Upper parts variable from almost white to pale cinnamon or buffy; underparts white; tail bicolored. Skull, although much smaller than in neighboring subspecies of *P. maniculatus* or *P. gossypinus*, much like those of the smaller subspecies of *P. maniculatus*; palatine slits relatively shorter; auditory bullae relatively slightly larger.

This species occupies the fallow fields and beaches of southeastern United States. Oldfield mice are remarkably efficient burrowers; the mouths of the burrows are usually marked by a mound of earth much like that made by pocket gophers. These mice are almost wholly herbivorous and seem to favor seeds.

Peromyscus polionotus albifrons Osgood

1909. *Peromyscus polionotus albifrons* Osgood, N. Amer. Fauna, 28:108, April 17, type from Whitfield, Walton Co., Florida.

MARGINAL RECORDS (Schwartz, 1954:568, unless otherwise noted).—Georgia: Beachton. Florida: type locality; Destin (Sherman, 1937:117); Ono Island (Sumner, 1926:158). Alabama: Bon Secour (Osgood, 1909:109). Florida: Quincy.

Peromyscus polionotus colemani Schwartz

1954. *Peromyscus polionotus colemani* Schwartz, Jour. Mamm., 35:566, November 29, type from ¾ mi. E of Campton, Spartanburg Co., South Carolina (Campton is about 2½ mi. SE Inman, South Carolina).

MARGINAL RECORDS (Schwartz, 1954:568, unless otherwise noted).—South Carolina: 2 mi. N Cleveland; 1½ mi. N Inman; 3 mi. N McCormick. Georgia: Whitehall. Alabama: Autaugaville; Centerville; extreme NE corner Jackson County (A. H. Howell, 1921:44, as *P. p. polionotus*); Sand Mountain, near Carpenter. Georgia: Tallulah Falls (Dice, 1934:246, as *P. p. polionotus*).

Peromyscus polionotus decoloratus A. H. Howell

1939. *Peromyscus polionotus decoloratus* A. H. Howell, Jour. Mamm., 20:363, August 14, type from Ponce Park, near Mosquito Inlet, Volusia Co., Florida.

MARGINAL RECORDS.—Florida: Bulow (A. H. Howell, 1939:363); type locality.

Peromyscus polionotus leucocephalus A. H. Howell

1920. *Peromyscus leucocephalus* A. H. Howell, Jour. Mamm., 1:239, December 4, type from Santa Rosa Island,

opposite Camp Walton, Santa Rosa Co., Florida. Known only from Santa Rosa Island.

1926. *P[eromyscus]. p[olionotus]. leucocephalus,* Sumner, Jour. Mamm., 7:155, August 9.

Peromyscus polionotus lucubrans Schwartz

1954. *Peromyscus polionotus lucubrans* Schwartz, Jour. Mamm., 35:564, November 29, type from 4½ mi. E Savannah River on U.S. Highway 301, Allendale Co., South Carolina.

MARGINAL RECORDS (Schwartz, 1954:566).—South Carolina: 4 mi. N Aiken, Shaw's Creek, on U.S. 1; St. Matthews; 5 mi. W Orangeburg on S.C. Highway 400; 7 mi. SE Ridgeland on S.C. Highway 128; type locality; Ellenton.

Peromyscus polionotus niveiventris (Chapman)

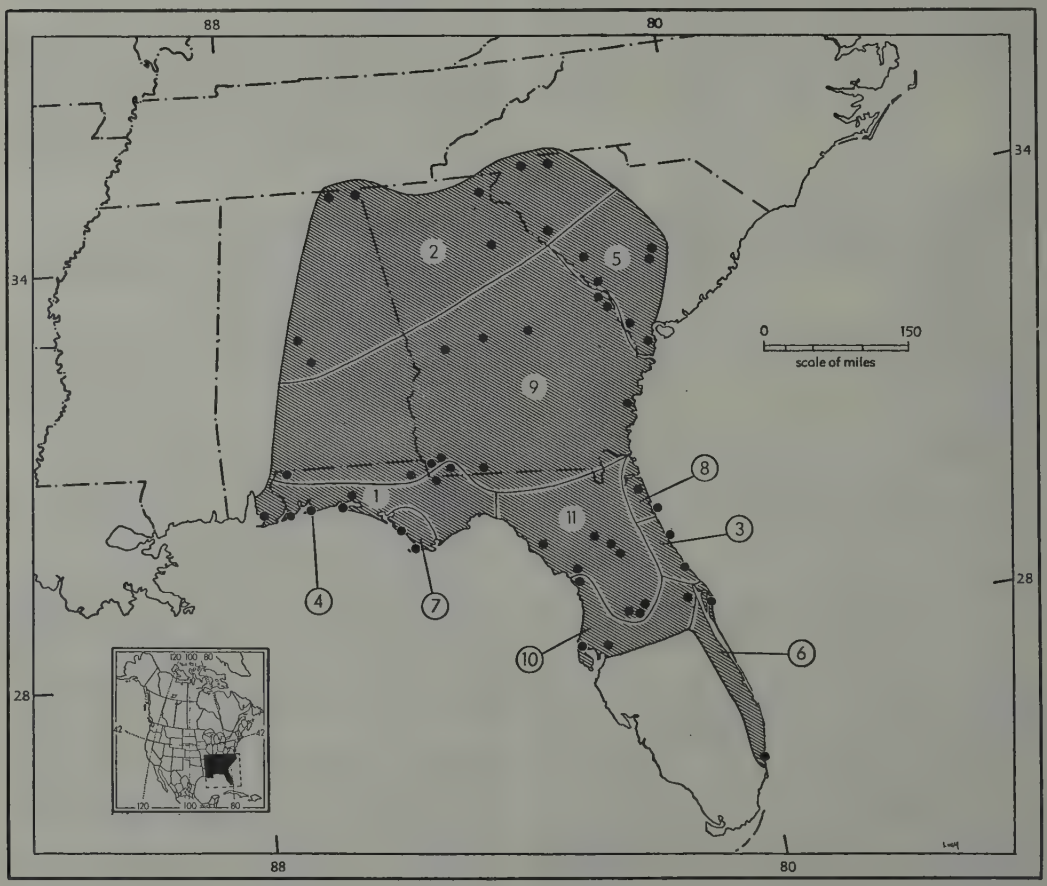
1889. *Hesperomys niveiventris* Chapman, Bull. Amer. Mus. Nat. Hist., 2:117, June 7, type from the east peninsula, opposite Micco, Brevard Co., Florida.

1909. *Peromyscus polionotus niveiventris,* Osgood, N. Amer. Fauna, 28:105, April 17.

MARGINAL RECORDS (Sherman, 1936:116).—Florida: Canaveral; Hillsboro Inlet.

Peromyscus polionotus peninsularis A. H. Howell

1939. *Peromyscus polionotus peninsularis* A. H. Howell, Jour. Mamm., 20:364, August 14, type from Saint Andrews Point Peninsula, Bay Co., Florida.



Map 360. *Peromyscus polionotus.*

Guide to subspecies
1. *P. p. albifrons*
2. *P. p. colemani*
3. *P. p. decoloratus*
4. *P. p. leucocephalus*
5. *P. p. lucubrans*
6. *P. p. niveiventris*
7. *P. p. peninsularis*
8. *P. p. phasma*
9. *P. p. polionotus*
10. *P. p. rhoadsi*
11. *P. p. subgriseus*

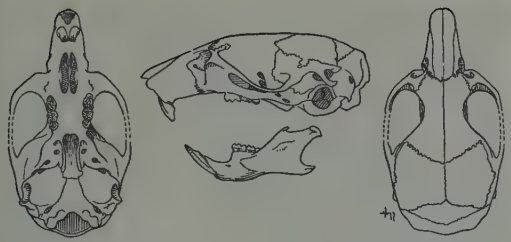


Fig. 347. *Peromyscus polionotus phasma*, Point Roma, Anastasia Island, St. Johns Co., Florida, No. 27076 K.U., ♂, X 1½.

MARGINAL RECORDS.—Florida: type locality; Cape San Blas (A. H. Howell, 1939:364).

Peromyscus polionotus phasma Bangs

1898. *Peromyscus phasma* Bangs, Proc. Boston Soc. Nat. Hist., 28:199, March, type from Point Romo, Anastasia Island, St. Johns Co., Florida.
1909. *Peromyscus polionotus phasma*, Osgood, N. Amer. Fauna, 28:107, April 17.

MARGINAL RECORDS.—Florida: border of St. Johns and Duval counties (Ivey, 1949:158); type locality.

Peromyscus polionotus polionotus (Wagner)

1843. *Mus polionotus* Wagner, Arch. Naturgesch., Jahrg. 9, 2:52, type from Georgia.
1907. *Peromyscus polionotus*, Osgood, Proc. Biol. Soc. Washington, 20:49, April 18.
1898. *Peromyscus subgriseus arenarius* Bangs, Proc. Boston Soc. Nat. Hist., 28:202, March, type from Hursman Lake, Scriven Co., Georgia. Not *P. eremicus arenarius* Mearns, 1896, type from near El Paso, Texas.
1898. *Peromyscus subgriseus baliolus* Bangs, Science, n. s., 8:215, August 19, a renaming of *arenarius* Bangs.

MARGINAL RECORDS (Schwartz, 1954:568, unless otherwise noted).—Georgia: 16 mi. SE Augusta; 1 mi. W Savannah River, highway 73; 6 mi. SW Townsend; Spring Hill Plantation, about 10 mi. SSW Thomasville (Quay, 1949:67); W bank Ichawaynochaway Creek, ½ mi. below U.S. 91; 7½ mi. E Colquitt. Florida: 3 mi. S Chipley; Century. Georgia: Butler; 7 mi. N Macon, highway 129; Donovan.

Peromyscus polionotus rhoadsi Bangs

1898. *Peromyscus subgriseus rhoadsi* Bangs, Proc. Boston Soc. Nat. Hist., 28:201, March, type from head of Anclote River, Hillsboro Co., Florida.
1909. *Peromyscus polionotus rhoadsi*, Osgood, N. Amer. Fauna, 28:107, April 17.

MARGINAL RECORDS (Schwartz, 1954:569, unless otherwise noted).—Florida: Citronelle (Sherman, 1937:116); 2 mi. E Oviedo; Dade City; type locality. Not found: Cootie River (Osgood, 1909:107).

Peromyscus polionotus subgriseus (Chapman)

1893. *Sitomys niveiventris subgriseus* Chapman, Bull. Amer. Mus. Nat. Hist., 5:341, December 22, type from Gainesville, Alachua Co., Florida.
1954. *P[eromyscus]. p[olionotus]. subgriseus*, Schwartz, Jour. Mamm., 35:562, November 29.

MARGINAL RECORDS (Schwartz, 1954:568–569, unless otherwise noted).—Florida: type locality; 20 mi. NE Ocala, at Lake Bryant; Ocala National Forest; Eustis; Tavares; Emeralda; Blitch Ferry (Osgood, 1909:105, as *P. polionotus*); Eugene.

Peromyscus melanotis J. A. Allen and Chapman
Black-eared Mouse

1897. *Peromyscus melanotis* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:203, June 16, type from Las Vigas, Veracruz.
1903. *Peromyscus cecilii* Thomas, Ann. Mag. Nat. Hist., ser. 7, 11:486, May, type from south slope Volcán de Orizaba, Puebla.
1904. *Peromyscus melanotis zamelas* Osgood, Proc. Biol. Soc. Washington, 17:59, March 21, type from Colonia García, Chihuahua.

External measurements: 132–175; 58–81; 17–22. Upper parts (winter-taken specimens) ochraceous tawny intermixed with dusky hairs, the dusky hairs more numerous middorsally; lateral line of ochraceous tawny fairly distinct; ears dusky brown with white edging; underparts and feet white; tail sharply bicolor, sooty brown above, white below. Summer pelage having dusky tones more pronounced. Skull resembling that of *P. maniculatus*, but with longer and slenderer rostrum and nasals; nasals more compressed posteriorly; braincase more rounded and inflated; auditory bullae relatively smaller.

This species seems to prefer a habitat dominated by bunch grass (sacaton), often in small clearings. It is a burrowing species, usually constructing a burrow in somewhat open habitats, but sometimes under logs and rocks. Although mainly nocturnal, black-eared mice sometimes emerge from their holes in late afternoon. A specimen obtained near Altotonga, Veracruz, on November 11, contained four 20-mm. embryos.

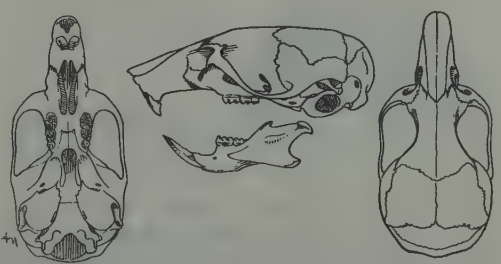
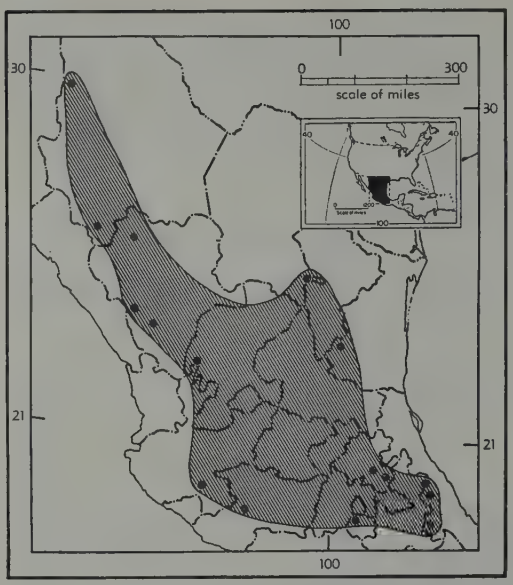


Fig. 348. *Peromyscus melanotis*, 6 km. SSE Altatongo, 9000 ft., Veracruz, No. 19479 K.U., ♀, X 1½.



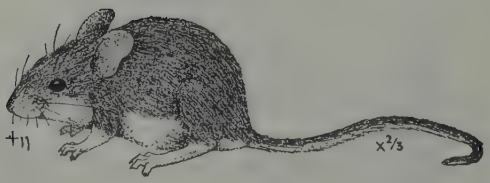
Map 361. *Peromyscus melanotis.*

MARGINAL RECORDS (Osgood, 1909:112, unless otherwise noted).—Chihuahua: Colonia García. Durango: near Guanaceví. Coahuila: 12 mi. E San Antonio de las Alazanas, 9000 ft. (33152 KU). Tamaulipas: Miquihuana. Hidalgo: Sierra de Pachuca; Tulancingo. Veracruz: 6 km. SSE Altotongo, 9000 ft. (19478 KU); 2 km. E Las Vigas, 8000 ft. (30356 KU); Santa Bárbara Camp. Morelos: Huitzilac. Michoacán: Mt. Tancítaro, 12,000 ft. (Hall and Villa, 1949:464). Jalisco: Sierra Nevada de Colima, 12,000 ft. Zacatecas: Valparaíso Mts. Durango: near El Salto; ¼ mi. E San Luis (Hooper, 1955:14). Chihuahua: Sierra Madre near Guadalupe y Calvo.

leucopus-group

Peromyscus leucopus

White-footed Mouse



External measurements: 156–205; 63–97; 19–24; 13–16. Upper parts variable, according to subspecies, from pale to rich reddish brown; feet and underparts white; tail bicolor but usually not sharply so, brownish above, whitish below; ears usually dusky, narrowly edged with whitish. Skull resembling that of *P. maniculatus.*

In areas where *P. maniculatus* and *P. leucopus* both occur, individual specimens are sometimes referred to the correct species only with considerable difficulty and identification is often a matter for the expert. Generally in such areas *P. leucopus* differs from *P. maniculatus* by larger size; longer, more sparsely-haired, and less sharply bicolor tail; and larger hind feet. The habitat is chiefly wooded areas.

In northern parts of its range *P. leucopus* breeds from April to October, but in the southern parts it breeds at all times. In Ontario, 5 (3–7) is the usual number of embryos, and in Michigan, 4 is the usual number of young born.

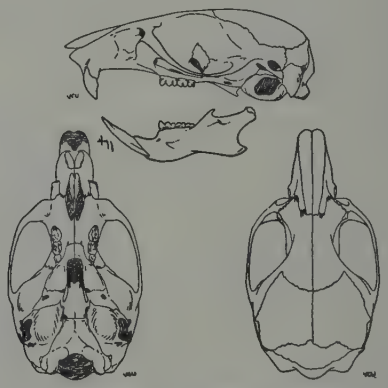


Fig. 349. *Peromyscus leucopus noveboracensis,* 4 mi. S Columbus, Cherokee Co., Kansas, No. 12360 K.U., ♂, X 1½.

Peromyscus leucopus affinis (J. A. Allen)

1891. *Hesperomys* (*Vesperimus*) *affinis* J. A. Allen, Proc. U.S. Nat. Mus., 14:195, July 24, type from Barrio, Oaxaca. (See J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:7, February 23, 1897.)

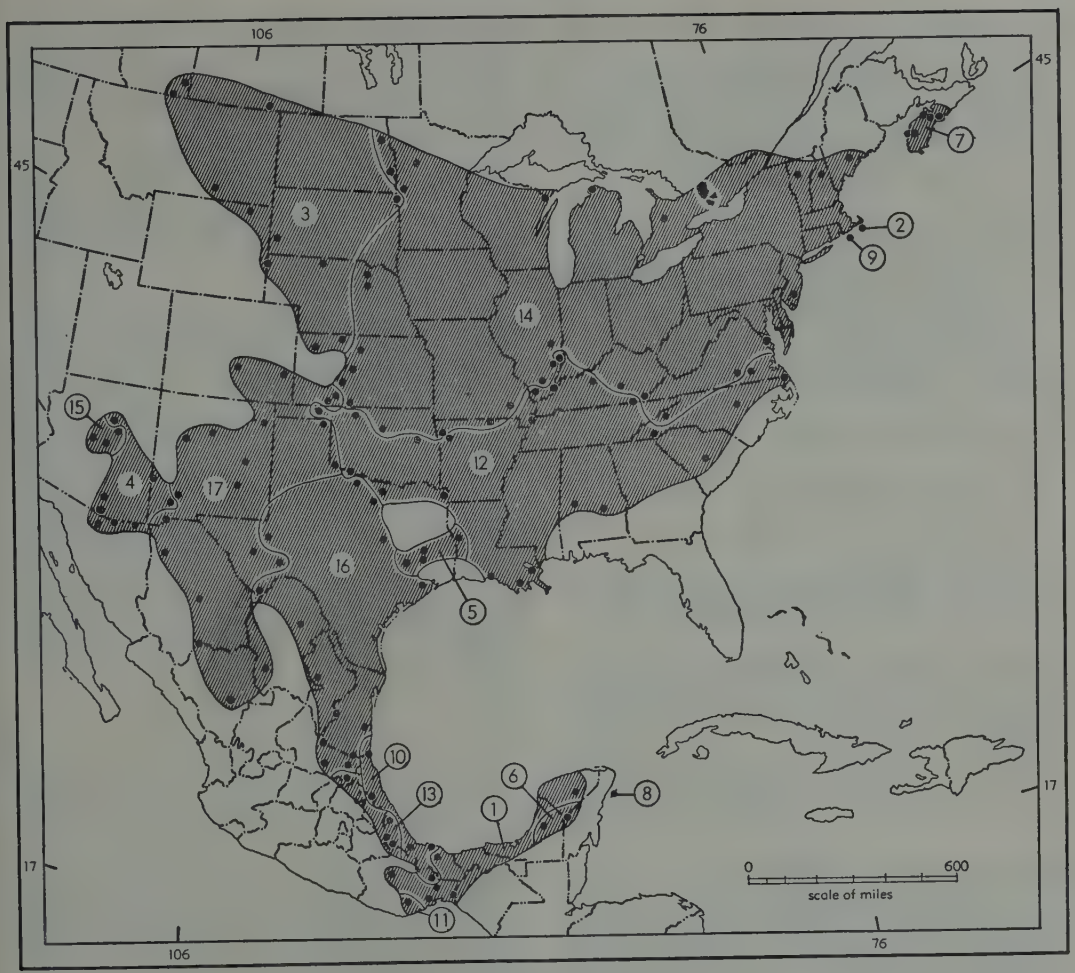
1909. *Peromyscus leucopus affinis,* Osgood, N. Amer. Fauna, 28:133, April 17.

1898. *Peromyscus musculoides* Merriam, Proc. Biol. Soc. Washington, 12:124, April 30, type from Cuicatlán, Oaxaca.

MARGINAL RECORDS (Osgood, 1909:134).—Yucatán: Chichén-Itzá. Oaxaca: Santa Efigenia; Huilotepec; Cuicatlán; type locality. Veracruz: Pasa Nueva.

Peromyscus leucopus ammodytes Bangs

1905. *Peromyscus leucopus ammodytes* Bangs, Proc. New England Zool. Club, 4:14, February 28, type from Monomoy Island, Barnstable Co., Massachusetts. Known only from Monomoy Island.



Map 362. *Peromyscus leucopus.*

Guide to subspecies
1. *P. l. affinis*
2. *P. l. ammodytes*
3. *P. l. aridulus*
4. *P. l. arizonae*
5. *P. l. brevicaudus*
6. *P. l. castaneus*
7. *P. l. caudatus*
8. *P. l. cozumelae*
9. *P. l. fuscus*
10. *P. l. incensus*
11. *P. l. lachiguiriensis*
12. *P. l. leucopus*
13. *P. l. mesomelas*
14. *P. l. noveboracensis*
15. *P. l. ochraceus*
16. *P. l. texanus*
17. *P. l. tornillo*

Peromyscus leucopus aridulus Osgood

1909. *Peromyscus leucopus aridulus* Osgood, N. Amer. Fauna, 28:122, April 17, type from Fort Custer, Big Horn Co., Montana.

MARGINAL RECORDS.—Alberta: Eagle Butte (Anderson, 1947:142). Saskatchewan: Big Muddy Lake (Soper, 1946:146). Minnesota: Browns Valley (Osgood, 1909: 124). Nebraska: Valentine (*ibid.*). Kansas (Cockrum, 1952: 177): Long Island; 6 mi. E, 10 mi. N Colby, 3100 ft. Nebraska: head Warbonnet Creek (Osgood, 1909:124). South Dakota: Custer (*ibid.*). Wyoming: 3 mi. N, 3 mi. W Rocky Point (32706 KU). Montana: Crow Agency (Osgood, 1909:124). Alberta: Milk River (Anderson, 1947: 142).

Peromyscus leucopus arizonae (J. A. Allen)

1894. *Sitomys americanus arizonae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:321, November 7, type from Fairbank, Cochise Co., Arizona.

1909. *Peromyscus leucopus arizonae,* Osgood, N. Amer. Fauna, 28:126, April 17.

MARGINAL RECORDS (Osgood, 1909:127, unless otherwise noted).—Arizona: Turkey Tanks. New Mexico (V. Bailey, 1932:150): Glenwood; Deming. Sonora: San Bernardino Ranch; Santa Cruz; Saric (Burt, 1938:58). Arizona: *8½ mi. N, 2½ mi. W Nogales, 3400 ft.* (22817 KU); Tumacacori Mission, near Tubac; Tucson.

Peromyscus leucopus brevicaudus Davis

1939. *Peromyscus leucopus brevicaudus* Davis, Occas. Papers Mus. Zool., Louisiana State Mus., 2:1, February 1, type from Huntsville, Walker Co., Texas.

MARGINAL RECORDS.—Louisiana: Vowells Mills (Lowery, 1943:244). Texas (Davis, 1939:2): 7 mi. E Huntsville; 6 mi. SE College Station; Trinity.

Peromyscus leucopus castaneus Osgood

1904. *Peromyscus texanus castaneus* Osgood, Proc. Biol. Soc. Washington, 17:58, March 21, type from Yohaltún, Campeche.
1909. *Peromyscus leucopus castaneus* Osgood, N. Amer. Fauna, 28:133, April 17.

MARGINAL RECORDS.—Quintana Roo: Santa Rosa (Hatt and Villa, 1950:235). Campeche: type locality.

Peromyscus leucopus caudatus Smith

1939. *Peromyscus leucopus caudatus* Smith, Proc. Biol. Soc. Washington, 52:157, October 11, type from Wolfville, Kings Co., Nova Scotia.

MARGINAL RECORDS (Smith, 1940:233).—Nova Scotia: type locality; Newport; Halifax; South Milford; Digby.

Peromyscus leucopus cozumelae Merriam

1901. *Peromyscus cozumelae* Merriam, Proc. Biol. Soc. Washington, 14:103, July 19, type from Cozumel Island, Yucatán. Known only from the type locality.
1909. *Peromyscus leucopus cozumelae,* Osgood, N. Amer. Fauna, 28:135, April 17.

Peromyscus leucopus fusus Bangs

1905. *Peromyscus leucopus fusus* Bangs, Proc. New England Zool. Club, 4:13, February 28, type from West Tisbury, Marthas Vineyard, Dukes Co., Massachusetts. Known only from island of Marthas Vineyard, Massachusetts.

Peromyscus leucopus incensus Goldman

1942. *Peromyscus leucopus incensus* Goldman, Proc. Biol. Soc. Washington, 55:157, October 17, type from Metlatoyuca, 800 ft., Puebla.

MARGINAL RECORDS (Goldman, 1942:158).—Tamaulipas: Altamira. Veracruz: San Andrés Tuxtla. Oaxaca: San Juan Guichicovi. Veracruz: Otatitlán. Puebla: type locality.

Peromyscus leucopus lachiguiriensis Goodwin

1956. *Peromyscus leucopus lachiguiriensis* Goodwin, Amer. Mus. Novit., 1791:5, September 28, type from San José Lachiguirí, about 4000 ft., Oaxaca. Known only from the type locality.

Peromyscus leucopus leucopus (Rafinesque)

1818. *Musculus leucopus* Rafinesque, Amer. Monthly Mag., 3:446, October. Type locality, pine barrens of Kentucky.
1895. *Peromyscus leucopus,* Thomas, Ann. Mag. Nat. Hist., ser. 6, 15:192, February.

MARGINAL RECORDS.—Illinois: Flat Rock (Necker and Hatfield, 1941:52). Kentucky: vicinity of Canmer (Barbour and Barbour, 1950:360); Mammoth (Osgood, 1909:116). North Carolina: Highlands (Odum, 1949:190). Virginia (Handley and Patton, 1947:163): Dinwiddie County; Accomac County. North Carolina (Osgood, 1909:117): Currituck; Raleigh. South Carolina: Calhoun County (Penney, 1950:85). Alabama (A. H. Howell, 1921:47): Barachias; Greensboro. Louisiana (Lowery, 1943:244): Gretna; Houma; Avery Island. Texas: vicinity of Texarkana (Strecker and Williams, 1929:259); 12 mi. S Gainesville (Russell, 1953:460); *3 mi. NE Leo* (*ibid.*). Oklahoma: Chattanooga (Blair, 1939:121, identification *fide* Russell, 1953:459); 1½ mi. N Beaver (Russell, 1953:459); Alva (Blair, 1939:121, identification *fide* Russell, 1953:459); Fort Gibson (Blair, 1939:120). Arkansas: Huntsville (Black, 1936:33). Tennessee: N end Reelfoot Lake (Goodpaster and Hoffmeister, 1952:367). Illinois (Necker and Hatfield, 1941:52): Alto Pass; Shawneetown.

Peromyscus leucopus mesomelas Osgood

1904. *Peromyscus texanus mesomelas* Osgood, Proc. Biol. Soc. Washington, 17:57, March 21, type from Orizaba, Veracruz.
1909. *Peromyscus leucopus mesomelas* Osgood, N. Amer. Fauna, 28:132, April 17.

MARGINAL RECORDS.—San Luis Potosí (Dalquest, 1953b:141): Huichihuayán; *3 km. W Axtla; 3 km. N Tamazunchale.* Veracruz: 5 km. N Jalapa, 4500 ft. (Davis, 1944:396); 3 km. N Presidio, 1500 ft. (19501 KU); 3 km. SE Orizaba, 5500 ft. (19491 KU). San Luis Potosí: *Xilitla* (Dalquest, 1953b:140).

Peromyscus leucopus noveboracensis (Fischer)

1829. [*Mus. sylvaticus*] δ *noveboracensis* Fischer, Synopsis mammalium, p. 318. Type locality, New York.
1897. *Peromyscus leucopus noveboracensis,* Miller, Proc. Boston Soc. Nat. Hist., 28:22, April 30.
1830. *Cricetus myoides* Gapper, Zool. Jour., 5:204, pl. 10. Type locality, between York and Lake Simcoe, Ontario.
1840. *Arvicola emmonsi* DeKay, *in* Emmons, Report on the quadrupeds of Massachusetts, p. 61. Based on animals from Massachusetts.
1841. *Peromyscus arboreus* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, 1:95.
1842. *Mus michiganensis* Audubon and Bachman, Jour. Acad. Nat. Sci. Philadelphia, p. 304. Type locality, Erie Co., Michigan (= Ohio).
1853. *Hesperomys campestris* Le Conte, Proc. Acad. Nat. Sci. Philadelphia, 6:413. Type locality, New Jersey.

1901. *Peromyscus leucopus minnesotae* Mearns, Proc. Biol. Soc. Washington, 14:154, August 9, type from Fort Snelling, Hennepin Co., Minnesota.

MARGINAL RECORDS (Osgood, 1909:119–120, unless otherwise noted).—North Dakota: Manuel (V. Bailey, 1927:77). Minnesota: vicinity Lake Itasca (Hatfield, 1938: 207). Michigan (Burt, 1946:210): Menominee County; Emmet County. Ontario: Mount Forest (Soper, 1923:247). Quebec: *along Ottawa River* (Anderson, 1947:142). Vermont: Mt. Mansfield (Moody, 1941:44). New Hampshire: Mt. Washington, Coos County (Starrett and Starrett, 1952: 398). Maine: Oakland. New Jersey: Wading River (Connor, 1953:232), thence southward along coast to Virginia (Handley and Patton, 1947:163): Richmond County; Luxemburg County. North Carolina: Weaverville. Kentucky: Black Mtn. (Barbour, 1951:106); Eubank. Illinois: Charleston (Necker and Hatfield, 1941:52); Parkersburg (*op. cit.*:53); 6 mi. S Marion (29317 KU). Missouri: Williamsville. Arkansas: Hardy; 5 mi. SE Fayetteville (Dellinger and Black, 1940:190). Oklahoma: Orlando (Blair, 1939: 120). Kansas (Cockrum, 1952:180; identity *fide* Russell, 1953:459): 4 mi. SW Aetna; 1 mi. W, 3 mi. S Kingsley; Arkansas River, 1½ mi. W, ½ mi. S Ellinwood; 3½ mi. W, ½ mi. S Beloit. Nebraska: Neligh; Verdigris. Minnesota: S end Ten Mile Lake (Leraas, 1942:345). North Dakota: Fargo (V. Bailey, 1927:77).

Peromyscus leucopus ochraceus Osgood

1909. *Peromyscus leucopus ochraceus* Osgood, N. Amer. Fauna, 28:124, April 17, type from Winslow, Navajo Co., Arizona.

MARGINAL RECORDS (Osgood, 1909:125).—Arizona: type locality; Baker Butte; Fort Verde.

Peromyscus leucopus texanus (Woodhouse)

1853. *Hesperomys texana* Woodhouse, Proc. Acad. Nat. Sci. Philadelphia, 6:242, type probably from vicinity of Mason, Mason Co., Texas.
1909. *Peromyscus leucopus texanus*, Osgood, N. Amer. Fauna, 28:127, April 17.
1891. *Vesperimus mearnsii*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:300, June 30, type from Brownsville, Cameron Co., Texas.
1896. *Peromyscus canus* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 3, March 25 (preprint of Proc. U. S. Nat. Mus., 18:445, May 23, 1896), type from Fort Clark, Kinney Co., Texas.

MARGINAL RECORDS (Osgood, 1909:131, unless otherwise noted).—Texas: Henrietta (Russell, 1953:459); Decatur (*ibid.*); 5 mi. N Waco (Strecker, 1929:216); Dickinson Bayou, thence south along coast to Tamaulipas: Soto la Marina. San Luis Potosí (Dalquest, 1953b:139–140): Ebano; *5 km. S Ebano*; Pujal; 1½ mi. E Río Verde; Presa de Guadalupe. Tamaulipas: Hidalgo. Nuevo León: Santa Catarina. Coahuila: Sabinas; see Baker (1956:262) for more western localities recorded after Map 362 was made. Texas: E base Burro Mesa, 3500 ft. (Borell and Bryant, 1942:32); Concho County.

Peromyscus leucopus tornillo Mearns

1896. *Peromyscus tornillo* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 3, March 25 (preprint of Proc. U. S. Nat. Mus., 18:445, May 23, 1896), type from Rio Grande, about 6 mi. above El Paso, El Paso Co., Texas.
1909. *Peromyscus leucopus tornillo*, Osgood, N. Amer. Fauna, 28:125, April 17.
1903. *Peromyscus texanus flaccidus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:599, November 14, type from Río Sestín, Durango.

MARGINAL RECORDS (Osgood, 1909:126, unless otherwise noted).—Colorado (Warren, 1942:204): Cañon City; Lamar. Kansas (Cockrum, 1952:179): 7 mi. S Kingsdown; 11½ mi. E Meade. Texas: Lipscomb. Oklahoma: 14 mi. S Olustee (Blair, 1939:121). New Mexico (V. Bailey, 1932:149): Pecos Valley, 8 mi. N Fort Sumner; Roswell. Texas: lower Limpia Canyon, 15–16 mi. NE Fort Davis (Blair, 1940:31); northeastern Terrell County (Hermann, 1950:381). Coahuila: 1 mi. SW San Pedro de las Colonias, 3700 ft. (40570 KU). Durango: San Gabriel; Rosario. Chihuahua: Chihuahua; Casas Grandes; U.S. and Mexican boundary, 100 mi. W El Paso. New Mexico: Lake Valley (V. Bailey, 1932:149); Laguna; Santa Fe; Clapham.

Peromyscus gossypinus
Cotton Mouse

External measurements: 160–205; 68–97; 20–26; ear (dry), 15–16.5. Upper parts dark brown, often with strong fulvous or cinnamon wash; usually dusky admixture middorsally; underparts white or creamy white; tail sometimes bicolor, brown above, whitish below; ears dusky brown, sometimes faintly edged with white; feet white. Skull essentially similar to that of *P. leucopus* and *P. maniculatus*, but is usually larger than sympatric or nearby subspecies of *P. leucopus* or *P. maniculatus;* molar teeth average larger than in *P. leucopus*.

The cotton mouse occurs in a variety of habitats ranging from barrier-beach islands to dry, timbered foothills. The latter situation seems to be most typical. Cotton mice nest in burrows and often under logs, under windrows of flotsam, and in natural crevices. They establish residence in human dwellings. Little is known of their breeding habits; presumably they are polyestrus and breed all year (after Hamilton, 1943:288).

Peromyscus gossypinus allapaticola Schwartz

1952. *Peromyscus gossypinus allapaticola* Schwartz, Jour. Mamm., 33:383, August 19, type from 12 mi. NE Rock Harbor, Key Largo, Monroe Co., Florida. Known only from Key Largo, Florida.

Peromyscus gossypinus anastasae Bangs

1898. *Peromyscus anastasae* Bangs, Proc. Boston Soc. Nat. Hist., 28:195, March, type from Point Romo, Anastasia Island, St. Johns Co., Florida.
1909. *Peromyscus gossypinus anastasae*, Osgood, N. Amer. Fauna, 28:141, April 17.

1898. *Peromyscus insulanus* Bangs, Proc. Boston Soc. Nat. Hist., 28:196, March, type from Cumberland Island, Camden Co., Georgia.

MARGINAL RECORDS.—Georgia: Cumberland Island (Anthony, 1928:363). Florida: type locality.

Fig. 350. *Peromyscus gossypinus gossypinus*, 2 mi. W Camp Cornelia (Okefinokee Ref. Hdqtrs.), Ware Co., Georgia, No. 23360 K.U., ♀, X 1½.

Peromyscus gossypinus gossypinus (Le Conte)

1853. *Hesp*[*eromys*]. *gossypinus* Le Conte, Proc. Acad. Nat. Sci. Philadelphia, 6:411. Type locality, Georgia; probably the Le Conte Plantation, near Riceboro, Liberty Co. (See Bangs, Proc. Biol. Soc. Washington, 10:123, November 5, 1896.)

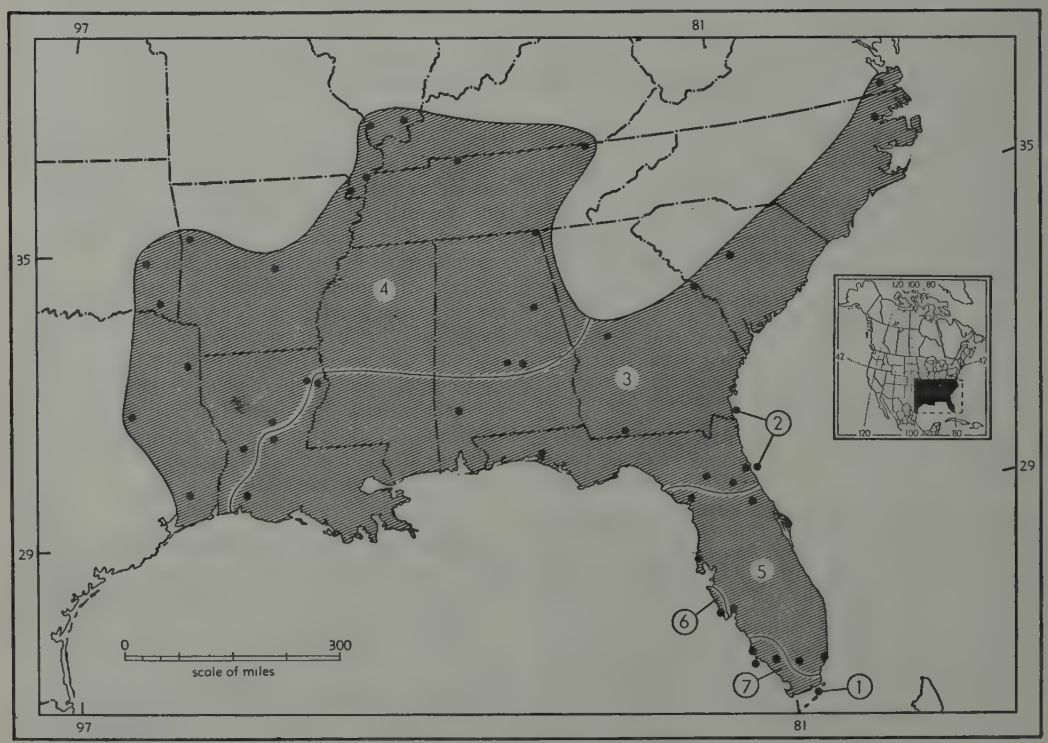
1896. *Peromyscus gossypinus*, Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 58:189, April 21.

1831. *Hyp*[*udaeus*]. *gossipinus* Le Conte, *in* McMurtrie, The animal kingdom . . . by the Baron Cuvier . . . , 1 (append.):434, a *nomen nudum*.

1855. *Hesperomys cognatus* Le Conte, Proc. Acad. Nat. Sci. Philadelphia, p. 442. Type locality, Georgia.

1896. *Peromyscus gossypinus nigriculus* Bangs, Proc. Biol. Soc. Washington, 10:124, November 5, type from Burbridge, Plaquemines Parish, Louisiana.

MARGINAL RECORDS (Osgood, 1909:138, unless otherwise noted).—Virginia: Suffolk (Handley and Patton, 1947: 164), thence southward along coastal mainland to Florida: Summer Haven (Sherman, 1937:117); Welaka (Moore, 1946:57); Gainesville (Sherman, 1937:117). Georgia: about 10 mi. SSW Thomasville (Quay, 1949:67). Florida: Whitfield (Sherman, 1937:117), thence along coast to



Map 363. *Peromyscus gossypinus.*

Guide to subspecies
1. *P. g. allapaticola*
2. *P. g. anastasae*
3. *P. g. gossypinus*
4. *P. g. megacephalus*
5. *P. g. palmarius*
6. *P. g. restrictus*
7. *P. g. telmaphilus*

Louisiana: Lake Charles; Le Compte (Lowery, 1936:28); Tallulah (*ibid.*). Alabama: Jackson (A. H. Howell, 1921: 48). Georgia: Butler; Augusta. South Carolina: Columbia. North Carolina: Bertie. Not found: Florida: Cartersville. Georgia: Barrington.

Peromyscus gossypinus megacephalus (Rhoads)

1894. *Sitomys megacephalus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:254, October, type from Woodville, Jackson Co., Alabama.
1909. *Peromyscus gossypinus megacephalus*, Osgood, N. Amer. Fauna, 28:138, April 17.
1896. *Peromyscus gossypinus mississippiensis* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 48:189, April 21, type from Samburg, Reelfoot Lake, Obion Co., Tennessee.

MARGINAL RECORDS.—Illinois: Ozark (Necker and Hatfield, 1941:53). Tennessee (Kellogg, 1939:281): Clarksville; Highcliff. Alabama (A. H. Howell, 1921:49): Sand Mtn., near Carpenter Station; Erin; Montgomery; Autaugaville. Louisiana (Lowery, 1943:244): Waverly; Fishville; Leesville. Texas (Osgood, 1909:139, unless otherwise noted): Sour Lake; Long Lake; northwestern Henderson County (McCarley and Bradshaw, 1953:516). Oklahoma (Blair, 1939:122): Glover; Red Oak. Arkansas (Dellinger and Black, 1940:190): Barling; Fourche Bayou, near Little Rock. Missouri (A. H. Howell, 1910:26): St. Francis River, W of Senath; Portageville. Illinois: Wolf Lake (*ibid.*). Not found: Missouri: Cushion Lake (A. H. Howell, 1910:26).

Peromyscus gossypinus palmarius Bangs

1896. *Peromyscus gossypinus palmarius* Bangs, Proc. Biol. Soc. Washington, 10:124, November 5, type from Oak Lodge, East Peninsula, opposite Micco, Brevard Co., Florida.

MARGINAL RECORDS (Sherman, 1937:117).—Florida: Gulf Hammock; Glenwood; Cape Canaveral; Miami; 10 mi. E Pine Crest; Charlotte Harbor; Tarpon Springs.

Peromyscus gossypinus restrictus A. H. Howell

1939. *Peromyscus gossypinus restrictus* A. H. Howell, Jour. Mamm., 20:364, August 14, type from Chadwick Beach, near Englewood, Sarasota Co., Florida. Known only from the type locality.

Peromyscus gossypinus telmaphilus Schwartz

1952. *Peromyscus gossypinus telmaphilus* Schwartz, Jour. Mamm., 33:384, August 19, type from Royal Palm Hammock, Collier Co., Florida.

MARGINAL RECORDS (Schwartz, 1952:385).—Florida: Naples; 8¾ mi. E Monroe Station; Marco Island.

boylii-group

Peromyscus boylii

Brush Mouse

External measurements: 180–238; 91–123; 20–26; 13–20. Upper parts varying according to subspecies from dark, rich tawny or brownish to grayish buffy or cinnamon, purest on sides; underparts white or creamy, sometimes with buffy pectoral spot or suffusion; tail long, well haired, somewhat penicillate, brownish above, white below; feet white. Skull of medium size for the genus; rostrum depressed; zygomata narrowing anteriorly; braincase rounded and inflated, but less so than in *P. truei*. Plantar surface of hind foot haired; mammae inguinal and pectoral.

As the vernacular name suggests, this mouse occurs in the chaparral habitat of arid to semi-arid regions. Rocky situations are preferred. The nest usually is under a rock, in a crevice or in a pile of sticks or brush. Embryos vary in number from 2 to 6.

Peromyscus boylii attwateri J. A. Allen

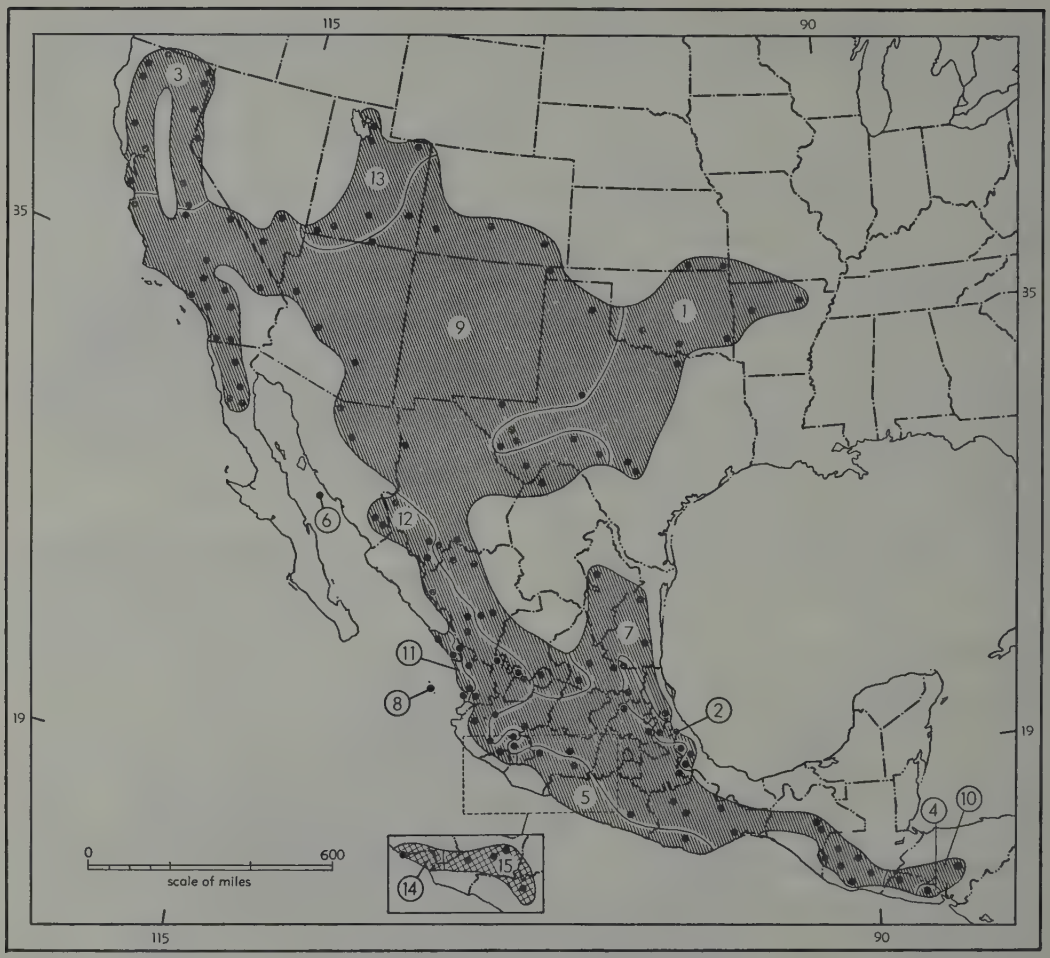
1895. *Peromyscus attwateri* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:330, November 8, type from Turtle Creek, Kerr Co., Texas.
1906. *Peromyscus boylei attwateri*, V. Bailey, Proc. Biol. Soc. Washington, 19:57, May 1.
1896. *Peromyscus bellus* Bangs, Proc. Biol. Soc. Washington, 10:137, December 28, type from Stilwell, Adair Co., Oklahoma.
1905. *Peromyscus boylei laceyi* V. Bailey, N. Amer. Fauna, 25:99, October 24, type from Turtle Creek, Kerr Co., Texas.

MARGINAL RECORDS.—Kansas (Cockrum, 1952:181): Cedarvale; 3 mi. S Galena, 850 ft. Arkansas: Batesville (Black, 1936:33); Ozark (10112 KU). Oklahoma: 2 mi. W Smithville (Blair, 1939:122); 3 mi. N Springer (Borell and Bryant, 1942:33). Texas (Osgood, 1909:149, unless otherwise noted): 11 mi. NE Gainesville (Russell, 1953:460); Boerne; Ingram; Paisano; Chinati Mts.; about 1 mi. N Mt. Livermore (Blair, 1940:31). Oklahoma: Wichita Mts. (Blair, 1939:122).

Peromyscus boylii aztecus (Saussure)

1860. *H[esperomys]. aztecus* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:105, type from southern México.
1909. *Peromyscus boylei aztecus*, Osgood, N. Amer. Fauna, 28:156, April 17.

MARGINAL RECORDS.—San Luis Potosí (Dalquest, 1953b:143): 8 mi. by road E Santa Barbarita; *10 km. E*



Map 364. *Peromyscus boylii* and *Peromyscus perfulvus*.

1. *P. boylii attwateri*
2. *P. boylii aztecus*
3. *P. boylii boylii*
4. *P. boylii cordillerae*
5. *P. boylii evides*
6. *P. boylii glasselli*
7. *P. boylii levipes*
8. *P. boylii madrensis*
9. *P. boylii rowleyi*
10. *P. boylii sacarensis*
11. *P. boylii simulus*
12. *P. boylii spicilegus*
13. *P. boylii utahensis*
14. *P. perfulvus chrysopus*
15. *P. perfulvus perfulvus*

Platanito. Veracruz (Osgood, 1909:158): Jalapa; Mirador. Puebla: Huauchinango (*ibid.*). San Luis Potosí (Dalquest, 1953b:143): *Cerro Conejo at Llano de Conejo*; 10 mi. E, 2 mi. N Ciudad del Maíz.

Peromyscus boylii boylii (Baird)

1855. *Hesperomys boylii* Baird, Proc. Acad. Nat. Sci. Philadelphia, 7:335, April, type from Middle Fork of American River, near present town of Auburn, Eldorado Co., California.

1896. *Peromyscus boylii* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 3, May 25 (preprint of Proc. U. S. Nat. Mus., 19:139, December 21, 1896).

1893. *Sitomys robustus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:335, December 16, type from Lakeport, Lake Co., California.

MARGINAL RECORDS (Osgood, 1909:144–145, unless otherwise noted).—California: Beswick (Grinnell, 1932: 176); Upper Lake; Lower Lake; Milford. Nevada: 3 mi. E (SE) Incline, 6250 ft., E shore Lake Tahoe (Hall, 1946:

519). California: Coarsegold; Dunlap (Grinnell, 1932: 176); Scott Valley; Encinosa Creek, 3 mi. W Vacaville (Hooper, 1944:55); Lakeport; Helena (Grinnell, 1932:176); Etna.

Peromyscus boylii cordillerae Dickey

1928. *Peromyscus boylii cordillerae* Dickey, Proc. Biol. Soc. Washington, 41:2, January 25, type from Mt. Cacaguatique, 3500 ft., Dept. San Miguel, El Salvador. Known only from the type locality.

Peromyscus boylii evides Osgood

1904. *Peromyscus spicilegus evides* Osgood, Proc. Biol. Soc. Washington, 17:64, March 21, type from Juquila, Oaxaca.
1909. *Peromyscus boylei evides* Osgood, N. Amer. Fauna, 28:152, April 17.

MARGINAL RECORDS (Hall and Villa, 1949:462).—Michoacán: Los Reyes; 1½ mi. SSE Tacámbaro, 5700 ft. Oaxaca: type locality.

Peromyscus boylii glasselli Burt

1932. *Peromyscus boylii glasselli* Burt, Trans. San Diego Soc. Nat. Hist., 7:171, October 31, type from San Pedro Nolasco Island, lat. 27° 58′ N, long. 111° 24′ W, Gulf of California, Sonora. Known only from the type locality.

Peromyscus boylii levipes Merriam

1898. *Peromyscus levipes* Merriam, Proc. Biol. Soc. Washington, 12:123, April 30, type from Mt. Malinche, 8400 ft., Tlaxcala.
1909. *Peromyscus boylei levipes*, Osgood, N. Amer. Fauna, 28:153, April 17.
1903. *Peromyscus sagax* Elliot, Field Columb. Mus., Publ. 71, Zool. Ser., 3(8):142, March 20, type from La Palma (not Pátzcuaro), Michoacán. (Regarded as inseparable from *levipes* by Hoffmeister, Jour. Mamm., 27:278, August 14, 1946.)
1903. *Peromyscus beatae* Thomas, Ann. Mag. Nat. Hist., ser. 7, 11:485, May, type from Mt. Orizaba, Veracruz.

MARGINAL RECORDS (Osgood, 1909:155, unless otherwise noted).—Nuevo León: Monterrey; *Cerro de la Silla.* Tamaulipas: La Vegonia (Hooper, 1952e:375); Santa María (Goodwin, 1954:12). Veracruz: Xuchil. San Luis Potosí (Dalquest, 1953b:142): 2½ mi. S Pendencia; *Agua Zarca; 6 km. NE Ciudad del Maíz.* Hidalgo: 16 km. NW Jacala (Baker and Villa, 1953:149); Tulancingo. Veracruz: 5 km. E Las Vigas, 8000 ft. (Davis, 1944:396); Orizaba. Oaxaca: mountains near Ozolotepec. Chiapas: San Cristóbal; *mountains near Comitán*; Comitán (Villa, 1949:513). Guatemala: Hda. Chancol; Sacapulas (Goodwin, 1934:41); San Lucas (*ibid.*); La Primavera (*ibid.*); Zunil. Chiapas: Volcán de Tacána, 3935 m. (Villa, 1949:513). Oaxaca: San Miguel; mountains W of Oaxaca; Tamazulapam. Guerrero: mountains near Chilpancingo. Michoacán: Pátzcuaro (Hall and Villa, 1949:462). Jalisco: Zapotlán; Ocotlán; 20 mi. SE Autlán, 8200 ft. (Hooper, 1955:15); 2 mi. W San Andrés (*ibid.*). San Luis Potosí: Villar. *Coahuila* (Baker, 1956: 255): *12 mi. E San Antonio de las Alazanas, 9000 ft.*

Peromyscus boylii madrensis Merriam

1898. *Peromyscus madrensis* Merriam, Proc. Biol. Soc. Washington, 12:16, January 27, type from María Madre Island, Tres Marías Islands, Nayarit.
1909. *Peromyscus boylei madrensis*, Osgood, N. Amer. Fauna, 28:152, April 17.

MARGINAL RECORDS (Osgood, 1909:152).—Nayarit: *María Cleofa Island*; type locality; *María Magdalena Island.*

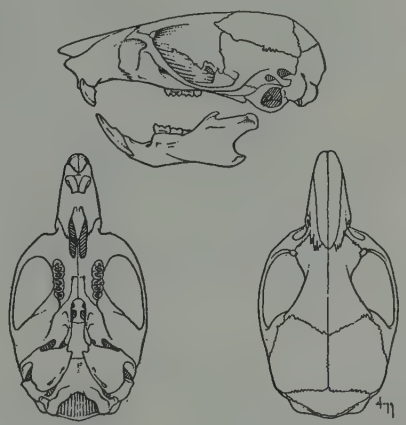


Fig. 351. *Peromyscus boylii attwateri*, Ozark, Franklin Co., Arkansas, No. 10114 K.U., ♂, X 1½.

Peromyscus boylii rowleyi (J. A. Allen)

1893. *Sitomys rowleyi* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:76, April 28, type from Noland Ranch, N side San Juan River, San Juan Co., about 1½ mi. above Four Corners, Utah.
1896. *P[eromysus]. b[oylii]. rowleyi*, Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 3, May 25 (preprint of Proc. U. S. Nat. Mus., 19:139, December 21, 1896).
1893. *Sitomys major* Rhoads, Amer. Nat., 27:831, September, type from Squirrel Inn, San Bernardino Co., California.
1893. *Sitomys rowleyi pinalis* Miller, Bull. Amer. Mus. Nat. Hist., 5:331, December 16, type from Granite Gap, Grant Co., New Mexico.
1896. *Peromyscus boylii penicillatus* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 2, May 25 (preprint of Proc. U. S. Nat. Mus., 19:139, December 21, 1896), type from Franklin Mts., near El Paso, El Paso Co., Texas.
1903. *Peromyscus gaurus* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3(10):157, May 7, type from San Antonio, Sierra San Pedro Mártir, Baja California.
1904. *Peromyscus parasiticus* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):244, January 7, type from Lone Pine, Inyo Co., California.
1904. *Peromyscus metallicola* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):245, January 7, type from Providencia Mines, Sonora.

MARGINAL RECORDS (Osgood, 1909:146–147, unless otherwise noted).—Utah: mouth Nigger Bill Canyon, E side Colorado River, 4 mi. above Moab Bridge, 3995 ft. (Durrant, 1952:320). Colorado: Coventry (Cary, 1911:107); Salida (Warren, 1942:205); Irwin's Ranch (*ibid.*). Oklahoma: 3 mi. N Kenton (Blair, 1939:122). Texas: 20⅗ mi. SW Canadien (6367 KU); Big Spring; The Bowl, 8000 ft.

(Davis and Robertson, 1944:269); Oak Creek, 5000 ft. (Borell and Bryant, 1942:32); Ozona; Rock Springs. Coahuila: Tinaja de Chavez, 6400 ft., El Jardín Ranch, Sierra del Carmen (Baker, 1956:256). Chihuahua: Colonia García; Parral. Durango: La Boquilla; San Gabriel. San Luis Potosí: mountains near Jesús María. Aguascalientes: ½ mi. W Rincón de Romos (Hooper, 1955:16). Durango: Durango; Arroyo de Bucy. Chihuahua: Balleza. Sonora (Burt, 1938: 59): Providencia Mines; Saric. Arizona: Walnut; Yarnell (Hatfield, 1942:155); Hualapai Peak (Borell and Bryant, 1942:33). California: Providence Mts. (Grinnell, 1933: 177); Mohave; San Gabriel Mts.; San Bernardino Mts.; San Jacinto Mts.; Mountain Spring (*op. cit.*:176). Baja California: Hanson Lagoon; San Matias Pass; Sierra San Pedro Mártir; Rancho San Antonio. California: Dulzura (4013 KU); Santa Ana Mts.; Pozo; Seaside (Grinnell, 1933:176); Camp Badger; northern portion Panamint Mts. (*op. cit.*: 177). Nevada (Hall, 1946:519): Cold Creek, 6000 ft.; Ash Spring, Pahranagat Valley, 3800 ft. Utah: Rainbow Bridge (Durrant, 1952:320).

Peromyscus boylii sacarensis Dickey

1928. *Peromyscus boylii sacarensis* Dickey, Proc. Biol. Soc. Washington, 41:3, January 25, type from San José del Sacare [= San José del Sacario of maps], 3600 ft., Chalatenango, El Salvador.

MARGINAL RECORDS.—Honduras: La Flor Archaga (Goodwin, 1942:161). El Salvador: type locality.

Peromyscus boylii simulus Osgood

1904. *Peromyscus spicilegus simulus* Osgood, Proc. Biol. Soc. Washington, 17:64, March 21, type from San Blas, Nayarit.
1909. *Peromyscus boylei simulus* Osgood, N. Amer. Fauna, 28:151, April 17.

MARGINAL RECORDS (Osgood, 1909:151).—Sinaloa: Mazatlán; *Chele* (Hooper, 1955:15); Escuinapa. Nayarit: *Navarrete*; type locality.

Peromyscus boylii spicilegus J. A. Allen

1897. *Peromyscus spicilegus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:50, March 15, type from Mineral San Sebastián, Mascota, Jalisco.
1909. *Peromyscus boylei spicilegus*, Osgood, N. Amer. Fauna, 28:149, April 17.

MARGINAL RECORDS (Osgood, 1909:150–151, unless otherwise noted).—Chihuahua: Mojarachic (Knobloch, 1942: 298); Sierra Madre, 65 mi. E Batopilas. Durango: La Laguna (Hooper, 1955:14); Coyotes. Zacatecas: Sierra Madre. Jalisco: La Laja. Zacatecas: Plateado. Jalisco: *2 mi. NNW Magdalena* (Hooper, 1955:14); 2 mi. W San Andrés (*ibid.*); 20 mi. SSE Autlán, 5500 and 6500 ft. (*ibid.*); Estancia Jalisco. Colima: Hda. San Antonio. Jalisco: Talpa. Nayarit: Jalisco; Pedro Pablo. Sinaloa: Plomosas. Durango: Chacala. Chihuahua: Sierra Madre, near Guadalupe y Calvo. Sonora: mountains near Alamos; Camoa (Laurie, 1953:392).

Peromyscus boylii utahensis Durrant

1946. *Peromyscus boylii utahensis* Durrant, Proc. Biol. Soc. Washington, 59:167, December 23, type from 5 mi. above lower power station, 5800 ft., Millcreek Canyon, Salt Lake Co., Utah.

MARGINAL RECORDS (Durrant, 1952:319).—Utah: Ogden; Hideout [Canyon]; 8 mi. N Escalante, 6500 ft.; Zion National Park; Santa Clara Creek; type locality.

Peromyscus perfulvus
Marsh Mouse

External measurements: 208–254; 110–138; 23–26. Upper parts bright cinnamon rufous with thinly scattered dusky hairs, which are more numerous on back than sides; underparts creamy; forefeet white and lacking dusky on wrists; hind feet white with brownish metatarsal area of variable extent; tail long, well haired, penicillate, unicolor sepia; soles of hind feet hairy on proximal 4th. Skull resembles that of *P. boylii*; braincase relatively long (in proportion to rostrum), little inflated; supraorbital border sharply angled but not beaded; interparietal large; tympanic bullae small.

Peromyscus perfulvus chrysopus Hooper

1955. *Peromyscus perfulvus chrysopus* Hooper, Occas. Papers. Mus. Zool., Univ. Michigan, 565:18, March 31, 1955, type from ½ mi. N Barro de Navidad, 50 ft., Jalisco.

MARGINAL RECORDS (Hooper, 1955:19).—Jalisco: shores of Bahía Tenacatita; *type locality; 3 mi. E Navidad.*

Peromyscus perfulvus perfulvus Osgood

1945. *Peromyscus perfulvus* Osgood, Jour. Mamm., 26:299, November 14, type from 10 km. W Apatzingán, 1040 ft., Michoacán.

MARGINAL RECORDS.—Michoacán: 12 mi. by road S Tzitzio, 3500 ft. (Hooper, 1955:19). Guerrero: Apaxtla, 4500 ft. (*ibid.*). Michoacán: type locality; *Apatzingán, 1500 ft.*; 1 mi. E, 6 mi. S Tacámbaro, 4000 ft. (Hall and Villa, 1949:461).

Peromyscus oaxacensis Merriam
Oaxacan Deer Mouse

1898. *Peromyscus oaxacensis* Merriam, Proc. Biol. Soc. Washington, 12:122, April 30, type from Cerro San Felipe, 10,000 ft., Oaxaca.

External measurements: 241–260; 120–135; 27–29; ear (dry), 15.8–17.5. Upper parts rich tawny mixed with black, darkest on back; underparts creamy white; orbital ring and spot at base of whiskers black; tail evenly bicolor, blackish above, white below. Skull resembling those of neighboring subspecies of *P. boylii*, but averaging larger and more robust; "cheek teeth larger; audital bullae actually slightly larger, relatively about same size; palatine slits larger" (Osgood, 1909:158); supraorbital border trenchant but not beaded.

MARGINAL RECORDS (Osgood, 1909:159, unless otherwise noted).—Oaxaca: [Papalo Santos] Reyes; Comaltepec. Chiapas: Triunfo, 1950 m. (Villa, 1949:513); Comitán Valley; Pinabete; Prusia, 1160 m. (Villa, 1949:513). Oaxaca: Cerro Atravesado, 4000 ft. (Goodwin, 1955b:1); *type locality*; 15 mi. W Oaxaca.

Peromyscus hylocetes
Southern Wood Mouse

External measurements: 203–238; 102–117; 25–27; ear (dry), 15.5–18.5. Upper parts pale ochraceous buff heavily mixed with dusky middorsally, becoming tawny on sides; lateral line narrow, tawny; orbital ring and spot at base of whiskers sharply defined, black; underparts creamy with slaty undercoloring showing through; feet chiefly white, dusky extending to carpal joint and over tarsal joint; tail sharply bicolor, blackish above, white below. Skull as in *boylii*-group, but with relatively large auditory bullae.

This species is distinguished from its nearest relatives by the combination of shorter tail, blackish dorsum, and large bullae.

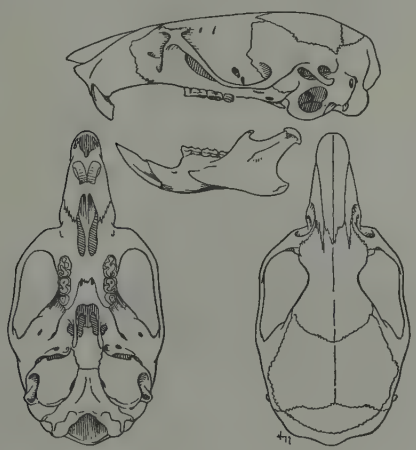


Fig. 352. *Peromyscus hylocetes hylocetes*, Cerro Curitzaran, 3½ km. NNW San Juan, 2220 meters, Michoacán, No. 28248 K.U., ♀ X, 1⅛.

Peromyscus hylocetes hylocetes Merriam

1898. *Peromyscus hylocetes* Merriam, Proc. Biol. Soc. Washington, 12:124, April 30, type from Pátzcuaro, 8000 ft., Michoacán.

MARGINAL RECORDS (Osgood, 1909:160, unless otherwise noted).—Michoacán: Patambán. Distrito Federal: 2 km. NW México, 3080 m. (Villa, 1953:427). México: Amecameca. Morelos: Huitzilac. Michoacán: 9 mi. SE Pátzcuaro, 8000 ft. (Hall and Villa, 1949:462); Cerro Curitzaran, 3¼ km. NNW San Juan, 2220 m. (28248 KU); Tancítaro, 10,000 ft. (Hall and Villa, 1949:462). Jalisco: Sierra Nevada de Colima; 20 mi. SSE Autlán, 6500 ft. (Hooper, 1955:16); 20 mi. SE Autlán, 8200 ft. (*ibid.*).

Peromyscus hylocetes yautepecus Goodwin

1955. *Peromyscus hylocetes yautepecus* Goodwin, Amer. Mus. Novit., 1732:4, June 10, type from Santo Tomás Teipán, 12 km. S San Bartolo, Yautepec, about 7000 ft., Oaxaca. Known only from the type locality.

Peromyscus pectoralis
White-ankled Mouse

External measurements: 180–232; 94–123; 20–23; ear (dry), 14.3–17.2. Upper parts pale ochraceous buff or pinkish buff overlaid with dusky, producing an over-all dark brown effect; underparts creamy white, sometimes with strong ochraceous-buff pectoral suffusion; feet white; tarsal joint with little if any extension of dusky from leg; tail brown above, white below or often extensively mottled below with dusky. Skull resembling that of *P. boylii* but differing in details which seem to vary geographically; molar tooth-row of *P. pectoralis* averages shorter (approximately 4.0 *versus* 4.6 for *P. boylii*); braincase of *pectoralis* actually and relatively longer.

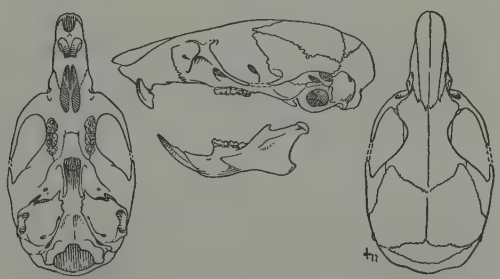


Fig. 353. *Peromyscus pectoralis laceianus*, 30 mi. SW Carlsbad, Eddy Co., New Mexico, No. 7401 K.U., ♂, X 1½.

Peromyscus pectoralis collinus Hooper

1952. *Peromyscus pectoralis collinus* Hooper, Jour. Mamm., 33:372, August 19, type from San José, 2000 ft., Sierra San Carlos, 12 mi. NW San Carlos, Tamaulipas.

MARGINAL RECORDS (Hooper, 1952e:374, unless otherwise noted).—Nuevo León: Santa Catarina (Osgood, 1909:164, as *P. p. eremicoides* but here assigned to *P. p. collinus* on geographic grounds); Monterrey; *Cerro de la Silla*. Tamaulipas: Tamaulipeca, 1500 ft.; *Marmolejo, Sierra San Carlos*; Ciudad Victoria, 1100 ft.; Sierra de Tamaulipas, near Acuña, 1600 ft.; 2 *km. W El Carrizo*; La Joya de Salas; near Jaumave, 2400 ft.; Miquihuana (Osgood, 1909:164, as *P. p. eremicoides* but here assigned to *P. p. collinus* on geographic grounds); Villagran, 1300 ft.

Map 365. Four species of *Peromyscus*.

Guide to kinds
1. *P. oaxacensis*
2. *P. hylocetes hylocetes*
3. *P. hylocetes yautepecus*
4. *P. pectoralis collinus*
5. *P. pectoralis eremicoides*
6. *P. pectoralis laceianus*
7. *P. pectoralis pectoralis*
8. *P. polius*

Peromyscus pectoralis eremicoides Osgood

1904. *Peromyscus attwateri eremicoides* Osgood, Proc. Biol. Soc. Washington, 17:60, March 21, type from Mapimi, Durango.
1909. *Peromyscus pectoralis eremicoides*, Lyon and Osgood, Bull. U.S. Nat. Mus., 62:128, January 28.

MARGINAL RECORDS (Osgood, 1909:164).—Arizona: Fort Huachuca. Chihuahua: Santa Eulalia. Durango: type locality. Coahuila: Jimulco. Durango: Indé.

Peromyscus pectoralis laceianus V. Bailey

1906. *Peromyscus pectoralis laceianus* V. Bailey, Proc. Biol. Soc. Washington, 19:57, May 1, type from Lacey Ranch, near Kerrville, Kerr Co., Texas.

MARGINAL RECORDS (Osgood, 1909:165, unless otherwise noted).—Texas: Throckmorton (Blair, 1954b:251); Ranger (*ibid.*); Llano; Austin; San Antonio; Fort Clark. Coahuila: 15 mi. E Las Vacas; 4 mi. W, 2 mi. S Hda. La Mariposa, 2300 ft. (44991 KU); Jaral (Osgood, 1909:164, as *P. p. eremicoides* but here referred to *P. p. laceianus* on verbal authority of R. H. Baker); Sierra Encarnación (*ibid.*, including Baker); 38 mi. S, 23 mi. E Boquillas, 4400 ft. Texas: Chisos Mts. (Borell and Bryant, 1942:33); 16 mi. SE Van Horn, 4100 ft. (Davis and Robertson, 1944:269); 1½ mi. N Nickel Creek, 5000 ft. (*ibid.*). New Mexico: near Carlsbad Cavern, 26 mi. SW Carlsbad, 4450 ft. (7411 KU). Texas: Pecos River, 55 mi. NW Comstock; Rock Springs; Mason.—Baker (1956:271) recorded still more western records in Coahuila after Map 365 was made.

Peromyscus pectoralis pectoralis Osgood

1904. *Peromyscus attwateri pectoralis* Osgood, Proc. Biol. Soc. Washington, 17:59, March 21, type from Jalpan, Querétaro.
1906. *Peromyscus pectoralis*, V. Bailey, Proc. Biol. Soc. Washington, 19:57, May 1.

MARGINAL RECORDS (Osgood, 1909:162, unless otherwise noted).—San Luis Potosí (Dalquest, 1953b:145): El Salto; Xilitla. Hidalgo: San Agustín (Hooper, 1952e:375). Querétaro: Toliman (*ibid.*). Jalisco: 3 mi. N Guadalajara (31606 KU); 6 mi. S Autlán (31777 KU). Nayarit: Ixtlan del Rio (Hooper, 1952e:375). Jalisco: Bolaños. Zacatecas: Monte Escobedo. San Luis Potosí: Jesús María; Villar (Dalquest, 1953b:145).

Peromyscus polius Osgood
Chihuahuan Mouse

1904. *Peromyscus polius* Osgood, Proc. Biol. Soc. Washington, 17:61, March 21, type from Colonia García, Chihuahua. Known only from the type locality.

External measurements: 210–234; 111–120; 25–26; ear (dry), 17.2–18.5. Upper parts pinkish buff intermixed with dusky producing a dark brown overall tone; lateral line narrow, pinkish buff; ears grayish dusky, narrowly edged with grayish white; underparts white; feet, wrists, and ankles white; tail bicolor, brown above, whitish below. Skull "similar in general form to that of [*P. boylii*] *rowleyi*, but decidedly larger; molar teeth decidedly larger; palatine slits longer; audital bullae actually about same size, relatively smaller" (Osgood, 1909: 178).

Hoffmeister (1951:22) tentatively places this species in the *boylii*-group and excludes it from the *truei*-group where it was placed by Osgood (1909).

truei-group

Peromyscus truei
Piñon Mouse

Subspecies reviewed by Hoffmeister, Illinois Biol. Monogr., 21(4):ix + 104 pp., 5 pls., 24 figs. in text, November 12, 1951.

External measurements: 171–231; 76–123; 20–27; ear (dry), 18–25.9. Upper parts approximately grayish brown, but varying much geographically; underparts white or whitish; lateral line usually distinct; feet white; tail approximately as long as head and body, distinctly bicolor, brownish or dusky above, whitish below. Ears large (usually longer than hind foot); fur long, silky. Skull medium in size for the genus; tooth-row usually 4.2–4.5; tympanic bullae large and well inflated; braincase vaulted; zygomata slightly convergent anteriorly.

Peromyscus truei is found most often in rocky situations among pygmy conifers, especially in arid or semi-arid regions. Occasionally it occurs at higher elevations. In California (according to McCabe and Blanchard, 1950:122) this species breeds principally in spring and summer, averages 3.40 litters per year, and has 3.43 (3–6) young per litter.

Peromyscus truei chlorus Hoffmeister

1941. *Peromyscus truei chlorus* Hoffmeister, Proc. Biol. Soc. Washington, 54:131, September 30, type from Lost Horse Mine, S end Little San Bernardino Mts., 69 mi. E Riverside, Riverside Co., California.

MARGINAL RECORDS (Hoffmeister, 1951:73, 74).—California: Hesperia, 2000 ft.; Barton Flats, 6400 ft.; Joshua Tree National Monument, 1¾ mi. N Lost Horse Well, 4000 ft.; type locality; Santa Rosa Peak, 7500 ft.; Kenworthy, 4500 ft.; *Strawberry Valley, San Jacinto Mts., 6000 ft.*; Santa Ana River, 5500 ft.

Peromyscus truei dyselius Elliot

1898. *Peromyscus dyselius* Elliot, Field Columb. Mus., Publ. 27, Zool. Ser., 1(10):207, April 16, type from Portola, San Mateo Co., California.
1951. *Peromyscus truei dyselius*, Hoffmeister, Illinois Biol. Monogr., 21(4):63, November 12.

MARGINAL RECORDS (Hoffmeister, 1951:65).—California: Palo Alto: Berglund Ranch, 1450 ft., 5 mi. N Corralitos.

Peromyscus truei erasmus Finley

1952. *Peromyscus truei erasmus* Finley, Univ. Kansas Publ., Mus. Nat. Hist., 5:265, May 23, type from 8 mi. NE Durango, 6200 ft., Durango. Known only from the type locality.

Peromyscus truei gentilis Osgood

1904. *Peromyscus gratus gentilis* Osgood, Proc. Biol. Soc. Washington, 17:61, March 21, type from Lagos, Jalisco.
1909. *Peromyscus truei gentilis* Osgood, N. Amer. Fauna, 28:175, April 17.

MARGINAL RECORDS (Hoffmeister, 1951:50, unless otherwise noted).—Chihuahua: Casas Grandes; Parral. Coahuila: 12 mi. S, 2 mi. E Arteaga, 7500 ft. (33195 KU); Sierra Encarnación. San Luis Potosí: 1 km. N Arenal (Dalquest, 1953b:147). Guanajuato: Silao. Jalisco: type locality; 7 mi. NNW Tepatitlán (Hooper, 1955:16). Aguascalientes: ¾ mi. W Rincón de Romos (*ibid.*). Zacatecas: Valparaíso. Durango: 4 mi. W Durango (Finley, 1952:266); La Laguna (Hooper, 1955:16); 1¾ mi. W San Luís (*ibid.*). Chihuahua: Sierra Madre, 40 mi. E Batopilas; Mojárachic; near Colonia García.

Peromyscus truei gilberti (J. A. Allen)

1893. *Sitomys gilberti* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:188, August 18, type from Bear Valley, San Benito Co., California.
1909. *Peromyscus truei gilberti*, Osgood, N. Amer. Fauna, 28:169, April 17.

MARGINAL RECORDS (Hoffmeister, 1951:61–63, unless otherwise noted).—Oregon: Sams Valley; Ashland. California: East Ridge, Beswick; Montgomery Creek; Quincy (Osgood, 1909:171); Middle Fork, American River, 1000 ft.; Dudley, 3000 ft.; Bass Lake; ½ mi. E Miramonte, 3500 ft.; Canyon Creek, 7 mi. E Orosi; Raymond, 940 ft.; 1 mi. W Coulterville, 1600 ft.; Marysville Buttes, 3–4 mi. NW Sutter, 300–500 ft.; 10 mi. W Gustine; 2 mi. NNE New Idria, 1900 ft.; *1 mi. S New Idria, 3700 ft.*; Waltham Cr., 4½ mi. SE Priest Valley, 1850 ft.; 2 mi. S San Miguel, 620 ft.; Matilija, thence up coast to 2 mi. S mouth Salinas R.; near Gilroy; Alum Rock Park; Santa Rosa; Blue Lakes; South Fork Mtn.; Scott Valley, 1400 ft.; 4 mi. S Ft. Jones. Oregon: Grants Pass.

Fig. 354. *Peromyscus truei nevadensis*, ½ mi. W Debbs Creek, Nevada, No. 68476 M.V.Z., ♂, X 1½.

Peromyscus truei gratus Merriam

1898. *Peromyscus gratus* Merriam, Proc. Biol. Soc. Washington, 12:123, April 30, type from Tlalpan, Distrito Federal, México.
1909. *Peromyscus truei gratus*, Osgood, N. Amer. Fauna, 28:173, April 17.
1903. *Peromyscus sagax* Elliot, Field Columb. Mus., Publ. 71, Zool. Ser., 3(8):142, March 20, type from La Palma, Michoacán.
1903. *Peromyscus pavidus* Elliot, Field Columb. Mus., Publ. 71, Zool. Ser., 3(8):142, March 20, type from Pátzcuaro, Michoacán.
1904. *Peromyscus zelotes* Osgood, Proc. Biol. Soc. Washington, 17:67, March 21, type from Queréndaro, Michoacán.

MARGINAL RECORDS (Hoffmeister, 1951:53, unless otherwise noted).—Jalisco: El Roble, 8 mi. NE Tepatitlán de Morales. Querétaro: Tequisquiapan. Hidalgo: Zimapán; Río Tasquillo, 26 km. E Zimapán, 5000 ft. (Davis, 1944: 396); Pachuca. Oaxaca: Oaxaca; Tamazulapan. Distrito Federal: 200 m. E San Mateo Xalpa, 2390 M. (Villa, 1953: 429). Michoacán: 2 mi. W Pátzcuaro, 6700 ft.; 11 mi. W Zamora, 5750 ft.

Peromyscus truei lagunae Osgood

1909. *Peromyscus truei lagunae* Osgood, N. Amer. Fauna, 28:172, April 17, type from La Laguna, Sierra Laguna, Baja California.

MARGINAL RECORDS (Hoffmeister, 1951:81).—Baja California: La Chuparosa; Mt. Miraflores.

Peromyscus truei martirensis (J. A. Allen)

1893. *Sitomys martirensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:187, August 18, type from Sierra San Pedro Mártir, 7000 ft., Baja California.
1909. *Peromyscus truei martirensis*, Osgood, N. Amer. Fauna, 28:171, April 17.
1903. *Peromyscus hemionotis* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3(10):157, May 7, type from Rosarito Divide, Sierra San Pedro Mártir, Baja California.

MARGINAL RECORDS (Hoffmeister, 1951:172, unless otherwise noted).—California: Laguna Mts., 5500 ft.; ¾ mi. S Mountain Springs, 3300 ft. Baja California: Laguna Hansen, 5200 ft., Sierra Juárez; San Matías Spring; Santa Rosa; Rosarito Divide; La Grulla, Sierra San Pedro Mártir, 7200–7500 ft.; El Rayo (Osgood, 1909:172).

Peromyscus truei montipinoris Elliot

1904. *Peromyscus montipinoris* Elliot, Field Columb. Mus. Publ. 90, Zool. Ser., 3(15):264, March 7, type from Lockwood Valley, near Mt. Piños, Ventura Co., California.
1951. *Peromyscus truei montipinoris*, Hoffmeister, Illinois Biol. Monogr., 21(4):66, November 12.

MARGINAL RECORDS (Hoffmeister, 1951:70–71).—California: Whitney Creek, 10,650 ft.; *Freemans Canyon, E slope Walker Pass, 4900 ft.*; Mojave; Mint Canyon, 2100–2400 ft.; Calabasas, 1200, 1300 ft.; Mt. Piños, 5500–8500 ft.; Cuyama Plain; Santiago Springs, Carrizo Plains; *divide W of McKittrick, 3000 ft.*; Kern River 12 mi. below Bodfish, 2000 ft.; Cannell Meadow, 7500 ft.; Jordan Hot Springs.

Peromyscus truei nevadensis Hall and Hoffmeister

1940. *Peromyscus truei nevadensis* Hall and Hoffmeister, Univ. California Publ. Zool., 42:401, April 30, type from ½ mi. W Debbs Creek, 6000 ft., Pilot Peak, Elko Co., Nevada.

MARGINAL RECORDS.—Utah (Durrant, 1952:321, unless otherwise noted): Raft River Mts.; Draper, 5000 ft.; Rock Canyon, 6 mi. E, 2 mi. N Provo (Hoffmeister, 1951: 45); Nephi, 5095 ft.; near Salina; Cedar City; Pine Valley, 6400 ft. (Hoffmeister, 1951:45). Nevada (Hoffmeister, 1951:44–45, unless otherwise noted): 11 mi. E Panaca, 6500–6600 ft.; 2 mi. S Pioche, 6000 ft.; Lat. 38° 17′ N, ¼ mi. W Utah–Nevada boundary, 7300 ft.; ¼ mi. W Lehman Cave, 7500 ft.; Cleve Creek, 6900 ft., Shell Creek Range; Overland Pass, E slope Ruby Mts., 8 mi. S Elko Co. line; W side Ruby Lake, 3 mi. N White Pine Co. line, 6700 ft.; type locality.

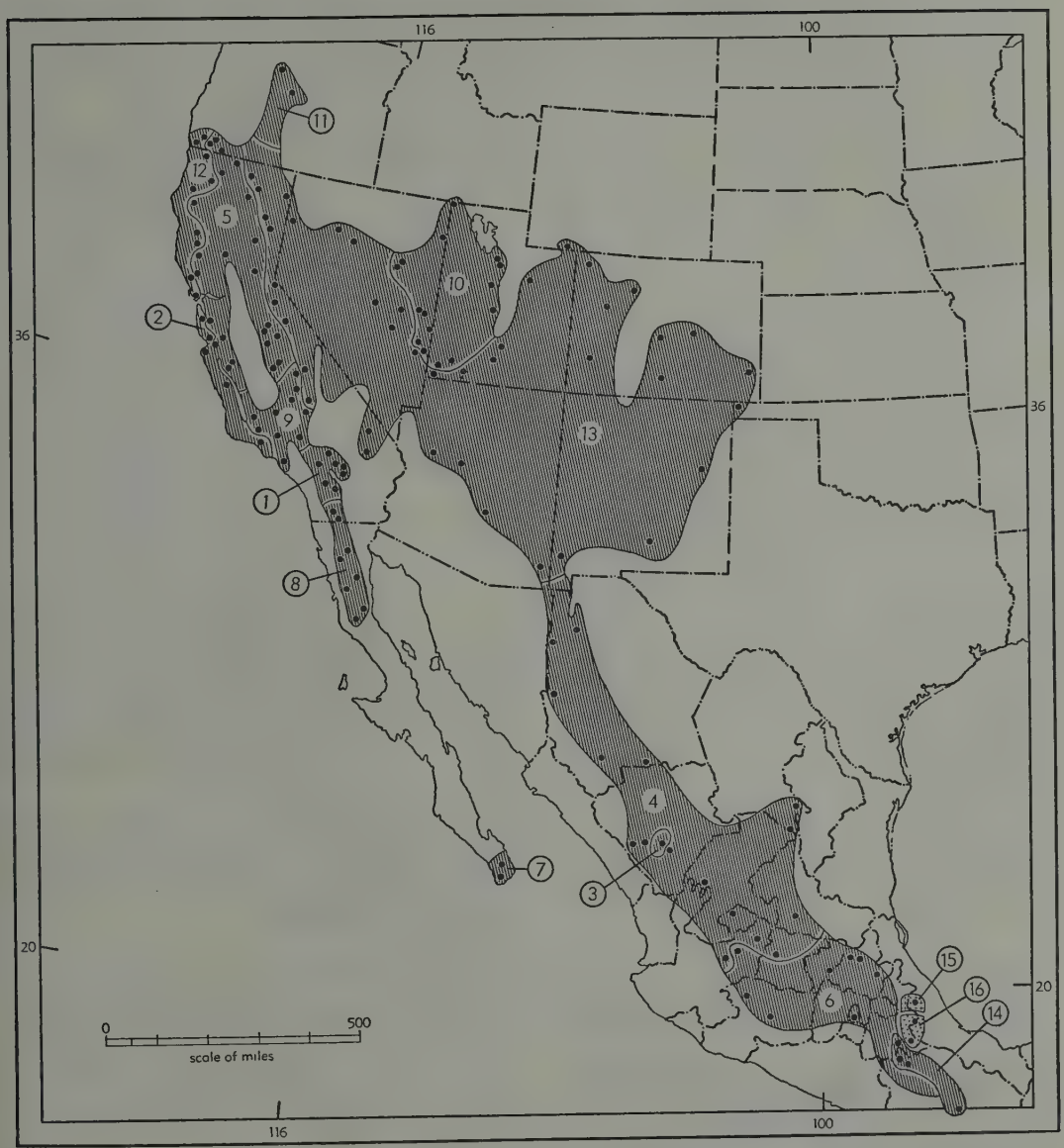
Peromyscus truei preblei V. Bailey

1936. *Peromyscus truei preblei* V. Bailey, N. Amer. Fauna, 55:188, August 29, type from Crooked River, 20 mi. SE [= 12 mi. S, 6 mi. E] Prineville, Oregon.

MARGINAL RECORDS (Hoffmeister, 1951:47).—Oregon: Warmsprings; type locality; *Crooked River, 4 mi. W mouth Bear Creek.*

Peromyscus truei sequoiensis Hoffmeister

1941. *Peromyscus truei sequoiensis* Hoffmeister, Proc. Biol. Soc. Washington, 54:129, September 30, 1 mi. W Guerneville, Sonoma Co., California.



Map 366. Three species of *Peromyscus*.

Guide to kinds

1. *P. truei chlorus*
2. *P. truei dyselius*
3. *P. truei erasmus*
4. *P. truei gentilis*
5. *P. truei gilberti*
6. *P. truei gratus*
7. *P. truei lagunae*
8. *P. truei martirensis*
9. *P. truei montipinoris*
10. *P. truei nevadensis*
11. *P. truei preblei*
12. *P. truei sequoiensis*
13. *P. truei truei*
14. *P. truei zapotecae*
15. *P. bullatus*
16. *P. mekisturus*

MARGINAL RECORDS (Hoffmeister, 1951:57).—Oregon: Galice, 500 ft. California: near Happy Camp; Taylor Creek, 5500 ft., Salmon Mts.; 1½ mi. S, ½ mi. E Willow Creek, 600 ft.; 3 mi. S Covelo; 3 mi. W summit Mt. Sanhedrin; Freestone; Ross, thence up coast to Oregon: Briggs Creek, 13 mi. SW Galice, 3000 ft.

Peromyscus truei truei (Shufeldt)

1885. *Hesperomys truei* Shufeldt, Proc. U.S. Nat. Mus., 8:407, September 14, type from Fort Wingate, McKinley Co., New Mexico.
1894. *P[eromyscus]. Truei*, Thomas, Ann. Mag. Nat. Hist., ser. 6, 14:365, November.
1890. *Hesperomys megalotis* Merriam, N. Amer. Fauna, 3:63, September 11, type from Black Tank, Little Colorado Desert, Coconino Co., Arizona.
1904. *Peromyscus lasius* Elliot, Field Columb. Mus., Publ. 90, Zool. Ser., 3(15):265, March 7, type from Hannopee Canyon, 7500 ft., Panamint Mts., Inyo Co., California.

MARGINAL RECORDS (Hoffmeister, 1951:37–40, unless otherwise noted).—California: Crescent Butte, Lava Beds National Monument; near Lower Lake (on geographic grounds from Osgood, 1909:171). Nevada: 17 mi. W Deep Hole, 4800 ft.; Eldorado Canyon, 6000 ft., Humboldt Range; S slope Granite Peak, East Range; Greenmonster Canyon, 7500 ft., Monitor Range; Water Canyon, 8 mi. N Lund; White River Valley, 14–15 mi. SW Sunnyside, 5500 ft.; Panaca. Utah (Durrant, 1952:323, unless otherwise noted): St. George; Zion National Park, 6500 ft.; Swamp Canyon, Bryce National Park; 5 mi. W Escalante, 6000 ft.; 13 mi. SE Price (Hoffmeister, 1951:38). Wyoming: Green River, 4 mi. NE Linwood, 5800 ft. Colorado: Escalante Hills, 20 mi. SE Ladore; McCoy; Rifle (Warren, 1942:206); near Coventry, 6800 ft.; Fort Garland; Salida; 20 mi. S Colorado Springs; Rinehart's Stage Station, 20 mi. S Lamar. Oklahoma: Tesequite Canyon. New Mexico: 15 mi. E Cuervo; Weed; Burro Mts. Arizona: Rock Creek Canyon, Chiricahua Mts., 7800 ft.; Walnut (Osgood, 1909: 169); Camp Verde, 3150 ft.; Pine Flat, Juniper Mts., 20 mi. NW Simmons. California: pass between Granite and Providence mts., 4100 ft.; Clark Mtn., 5000–7400 ft.; Little Lake, 3100 ft.; Grays Meadow, Kearsarge Pass, Sierra Nevada, 6000 ft.; Williams Butte, 7000 ft.; Leavitts Meadow; ¼ mi. W Woodfords, 5700 ft.; Millford (Osgood, 1909:169); Susanville (*ibid.*); 1 mi. NNW Old Fort Crook.

Peromyscus truei zapotecae Hooper

1957. *Peromyscus truei zapotecae* Hooper, Occas. Papers Mus. Zool. Univ. Michigan 586:6, April 30, type from 1 mi. E Tlacolula, 5700 ft., Oaxaca.

MARGINAL RECORDS (Hooper, 1957:7).—Puebla: 3 mi. N Tehuacán, 5500 ft. Oaxaca: type locality; vicinity Nochistlán, 7000 ft.; vicinity Huajuapan, 4800 ft.

Peromyscus bullatus Osgood
Perote Mouse

1904. *Peromyscus bullatus* Osgood, Proc. Biol. Soc. Washington, 17:63, March 21, type from Perote, Veracruz.

External measurements of the type, an adult female, are: 200; 93+; 23; 25 (dry). The tail of the type is broken. Upper parts rich ochraceous tawny heavily washed with dusky, especially middorsally; underparts creamy white; feet white; tail brownish above, white below; "auditory bullae greatly enlarged, and nearly 20 per cent larger than in *P. truei*" (Hoffmeister, 1951:25).

MARGINAL RECORDS.—Veracruz: *3 km. W Limón* (Hoffmeister, 1951:25); type locality.

Fig. 355. *Peromyscus bullatus*, 2 km. W Limón, 7500 ft., Veracruz, No. 30478 K.U., ♀, X 1½.

Peromyscus nasutus
Rock Mouse

External measurements: 180–206; 91–109; 22–24; 18–23. Upper parts brownish, the ochraceous tones considerably subdued; underparts white; tail bicolored, upper surface brownish, white below. Tail equal to or shorter than head and body. Skull essentially as in *P. truei* but usually with relatively longer rostrum.

This species is difficult to distinguish from *P. truei*. *P. nasutus* is usually grayer and its auditory bullae are considerably (20 per cent) larger than in specimens of *P. truei* obtained from areas where both species occur together.

Peromyscus nasutus comanche Blair

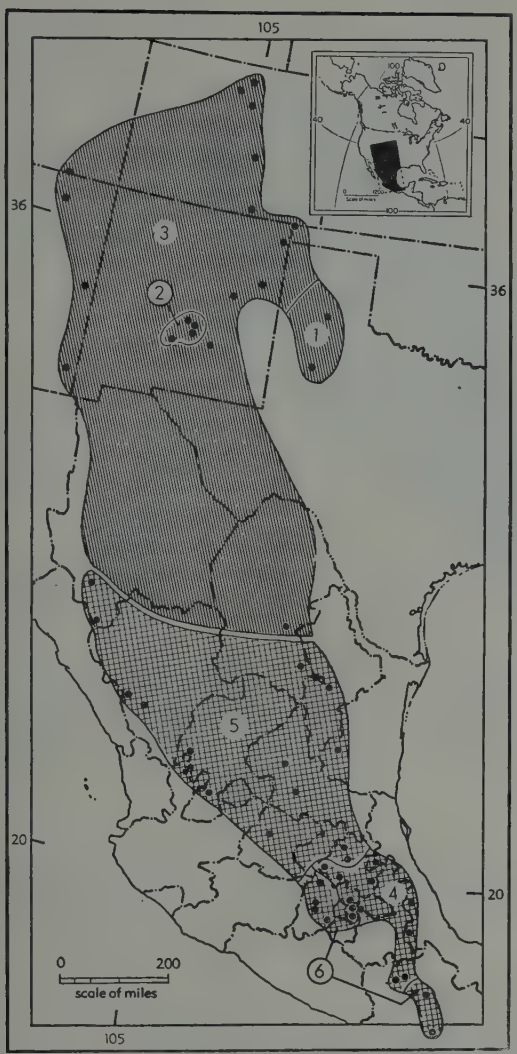
1943. *Peromyscus comanche* Blair, Contrib. Lab. Vert. Zool., Univ. Michigan, 24:7, July, type from Tule Canyon, Briscoe Co., Texas.
1951. *Peromyscus nasutus comanche*, Hoffmeister, Illinois Biol. Monogr., 21(4):25, November 12.

MARGINAL RECORDS.—Texas: type locality; Coopers Canyon (Blair, 1943b:1).

Peromyscus nasutus griseus Benson

1932. *Peromyscus nasutus griseus* Benson, Univ. California Publ. Zool., 38:338, April 14, type from the Malpais 3¼ mi. W Carrizozo, 5150 ft., Lincoln Co., New Mexico.

MARGINAL RECORDS.—New Mexico: North Cerro Prieto, 6200 ft., 17 mi. NW Carrizozo (Benson, 1932:338); 4 mi. (by road) NW Carrizozo (Bradt, 1932:324); type locality; Malpais Spring (Blair, 1941:226).



Map 367. *Peromyscus nasutus* and *Peromyscus difficilis*

1. *P. nasutus comanche*
2. *P. nasutus griseus*
3. *P. nasutus nasutus*
4. *P. difficilis amplus*
5. *P. difficilis difficilis*
6. *P. difficilis felipensis*

Peromyscus nasutus nasutus (J. A. Allen)

1891. *Vesperimus nasutus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:299, June 30, type from Estes Park, Larimer Co., Colorado.
1909. *Peromyscus nasutus*, Osgood, N. Amer. Fauna, 28: 176, April 17.

MARGINAL RECORDS.—Colorado: Bingham Hill, 6 mi. NW Fort Collins, 5300 ft. (Hoffmeister, 1951:95); Boulder (Warren, 1942:207); Colorado Springs (*ibid.*); Trinidad (*ibid.*). Oklahoma: 3 mi. N Kenton (Blair, 1939:123). New Mexico: Clayton (Osgood, 1909:177); Tucumcari (*ibid.*); Santa Rosa (V. Bailey, 1932:157); Hondo Canyon (*op. cit.*:158). Coahuila: Sierra de San Marcos, 7250 ft., 2 mi. N, 18 mi. W Santa Teresa (Baker, 1956:268). Arizona: S of Fly Peak, Chiricahua Mts. (Cahalane, 1939:434); Springerville (Osgood, 1909:177); Tuba City (Benson, 1935:452). Utah: Rainbow Bridge, 4000 ft. (Durrant, 1952:324). Colorado: type locality.

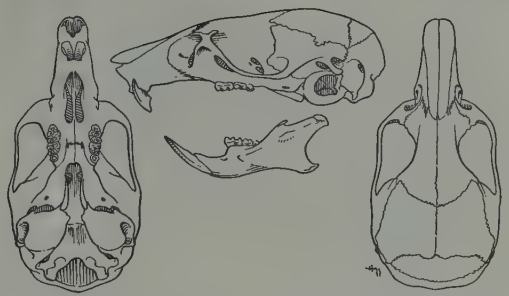


Fig. 356. *Peromyscus nasutus nasutus*, 1½ mi. NW Golden, 6200 ft., Jefferson Co., Colorado, No. 29156 K.U., ♂, X 1½.

Peromyscus difficilis
Zacatecan Deer Mouse

External measurements: 212–260; 115–145; 24–28; 20–28. Color essentially as in *P. truei*, but buffy pectoral spot or suffusion sometimes present. Tail always longer than head and body; ears actually large but relatively smaller than in other species of the *truei* group; "skull large (usually more than 30 mm. in length) with long maxillary toothrow (4.75 mm. or more); auditory bullae large but not greatly inflated" (Hoffmeister, 1951:25).

Peromyscus difficilis amplus Osgood

1904. *Peromyscus amplus* Osgood, Proc. Biol. Soc. Washington, 17:62, March 21, type from Coixtlahuaca, Oaxaca.
1909. *Peromyscus difficilis amplus* Osgood, N. Amer. Fauna, 28:181, April 17.

MARGINAL RECORDS (Osgood, 1909:182, unless otherwise noted).—Veracruz: 6 km. WSW Zacualpilla, 6500 ft. (30390 KU). Hidalgo: Tulancingo. Veracruz: Perote; 3 km. W Acultzingo, 7000 ft. (19541 KU). Oaxaca: type locality; Tamazulapam. Puebla: Río Otlati, 15 km. NW San Martín [Texmelucán], 8700 ft. (Davis, 1944:396). México: 23 km. E México City, 7500 ft. (*ibid.*). Hidalgo: Tula; Marqués.

Peromyscus difficilis difficilis (J. A. Allen)

1891. *Vesperimus difficilis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:298, June 30, type from Sierra de Valparaíso, Zacatecas.

Fig. 357. *Peromyscus difficilis amplus*, Lago Salido, km. [post]253 E México, 8000 ft., Puebla, No. 14712 K.U., sex ?, X 1½.

1897. [*Peromyscus*] *difficilis*, Trouessart, Catalogus mammalium . . . , fasc. 3, 518.

MARGINAL RECORDS (Osgood, 1909:180–181, unless otherwise noted).—Chihuahua: mountains 65 mi. E Batopilas. Coahuila: 12 mi. S, 2 mi. E Arteaga, 7500 ft. (33205 KU); 12 mi. E San Antonio de las Alazanas, 9000 ft. (33214 KU). Nuevo León: 20 km. N Galeana, 7000 ft. (Hooper, 1947:51). Tamaulipas: Miquihuana. San Luis Potosí: Charcos; 3 km. SW San Isidro (Dalquest, 1953b:149). Hidalgo: Encarnación; Ixmiquilpan. Guanajuato: Santa Rosa. Zacatecas: Plateado; Sierra de Valparaíso. Durango: El Salto; 1¼ mi. W San Luis (Hooper, 1955:17). Chihuahua: mountains near Guadalupe y Calvo.

Peromyscus difficilis felipensis Merriam

1898. *Peromyscus felipensis* Merriam, Proc. Biol. Soc. Washington, 12:122, April 30, type from Cerro San Felipe, 10,200 ft., Oaxaca.

1909. *Peromyscus difficilis felipensis*, Osgood, N. Amer. Fauna, 28:182, April 17.

MARGINAL RECORDS (Osgood, 1909:183, unless otherwise noted).—México: 6 mi. NNW Acambay (Hooper, 1955:18); Río Frío, 3000 m. (Hooper, 1947:51); Amecameca; Lago Sempoala, 45 km. SW Mexico City, 9400 ft. (Davis, 1944:397); Toluca Valley; Salazar. Osgood (1909: 183) considers specimens from Cerro San Felipe, Oaxaca, as representing an isolated segment of the range, and Goodwin (1955b:2) records the subspecies from Mixtepec, 6000 ft., Oaxaca.

melanophrys-group

Peromyscus melanophrys

Plateau Mouse

Reviewed by Baker, Univ. Kansas Publ., Mus. Nat. Hist., 5:251–258, 1 fig., April 10, 1952.

External measurements: 235–280; 122–163; 26–29; 18–21 (dry). Upper parts ochraceous, buffy, or tawny, finely sprinkled with dusky; underparts creamy white with much basal plumbeous showing through; feet white; tail bicolored, dusky above, white below. Skull with trenchant supraorbital ridge; smoothly arched dorsally in lateral view; temporal region swollen; nasals approximately parallel-sided; auditory bullae smaller than in *truei* group but larger than in *mexicanus* group.

This mouse is a representative of a rather striking group of large, notably long-tailed mice inhabiting the more arid regions of southern Mexico. It lives chiefly among rocks, and differs from nearly all other species [of *Peromyscus*] of Mexico in long tail and slightly beaded skull (after Osgood, 1909: 186).

Peromyscus melanophrys coahuilensis Baker

1952. *Peromyscus melanophrys coahuilensis* Baker, Univ. Kansas Publ., Mus. Nat. Hist., 5:257, April 10, type from 7 mi. S and 1 mi. E Gómez Farías, 6500 ft., Coahuila.

MARGINAL RECORDS (Baker, 1952:258).—Coahuila: 17 mi. N, 8 mi. W Saltillo; type locality; 2 mi. E, ¼ mi. S la Ventura.

Peromyscus melanophrys consobrinus Osgood

1904. *Peromyscus melanophrys consobrinus* Osgood, Proc. Biol. Soc. Washington, 17:66, March 21, type from Berriozábal, Zacatecas.

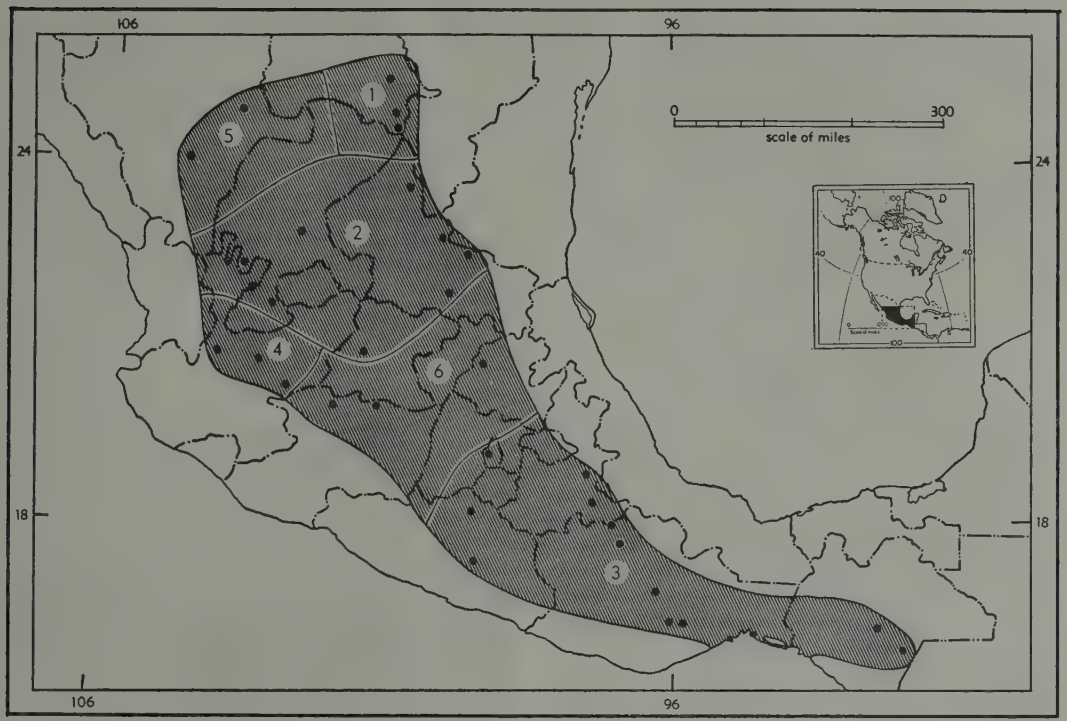
MARGINAL RECORDS (Baker, 1952:254–255, unless otherwise noted).—San Luis Potosí: 1 mi. E La Paz (Dalquest, 1953:150); Presa de Guadalupe (*ibid.*); 2 mi. NW Tepeyac, 3400 ft., 14 mi. N, 29 mi. W Ciudad del Maíz; 1¼ mi. E Río Verde (Dalquest, 1953:150). Guanajuato: Silao. Zacatecas: 3 mi. SW Jalpa, 4600 ft.; Monte Escobedo; 2 mi. ESE Troncosa, 7000 ft.

Peromyscus melanophrys melanophrys (Coues)

1874. *Hesperomys* (*Vesperimus*) *melanophrys* Coues, Proc. Acad. Nat. Sci. Philadelphia, 26:181, December 15, type from Santa Efigenia, Oaxaca.

1897. *P*[*eromyscus*]. *melanophrys*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:51, March 15.

Fig. 358. *Peromyscus melanophrys micropus*, 4 mi. NE Ocotlán, Jalisco, No. 31768 K.U., ♀, X 1¼.



Map 368. *Peromyscus melanophrys.*

1. *P. m. coahuilensis*
2. *P. m. consobrinus*
3. *P. m. melanophrys*
4. *P. m. micropus*
5. *P. m. xenurus*
6. *P. m. zamorae*

1894. *Peromyscus leucurus* Thomas, Ann. Mag. Nat. Hist., ser. 6, 14:364, November, type from Tehuantepec, Oaxaca.
1903. *Peromyscus leucurus gadovii* Thomas, Ann. Mag. Nat. Hist., ser. 7, 11:484, May, type from San Carlos [= Yautepec], Oaxaca.

MARGINAL RECORDS (Baker, 1952:254).—Distrito Federal: Contreras, 2600 m. Puebla: Chalchicomula; Tehuacán, 1700 m. Oaxaca: Teotitlán, 950 m.; 1 km. NNW Cuicatlán, 560 m.; San Miguel. Chiapas: San Bartolomé; San Vicente. Oaxaca: Las Vacas; *near Tehuantepec*; San Bartolo (= Coyotepec); *near Totolapa.* Guerrero: 15 mi. S Chilpancingo, 4500 ft.; *Los Sabinos, 1210 m.*; 14 mi. S, 1 mi. W Iguala, 2600 ft.

Peromyscus melanophrys micropus Baker

1952. *Peromyscus melanophrys micropus* Baker, Univ. Kansas Publ., Mus. Nat. Hist., 5:255, April 10, type from 3 mi. N Guadalajara, Jalisco.

MARGINAL RECORDS (Baker, 1952:256, unless otherwise noted).—Jalisco: 2 mi. NNW Magdalena (Hooper, 1955:18); 2 mi. NW Magdalena, 4500 ft.; type locality; 4 mi. NE Ocotlán, 5050 ft.

Peromyscus melanophrys xenurus Osgood

1904. *Peromyscus xenurus* Osgood, Proc. Biol. Soc. Washington, 17:67, March 21, type from City of Durango, Durango.
1952. *Peromyscus melanophrys xenurus,* Baker, Univ. Kansas Publ., Mus. Nat. Hist., 5:256, April 10.

MARGINAL RECORDS (Baker, 1952:256).—Durango: 3 mi. NNW Cuencamé; 4 mi. W Durango.

Peromyscus melanophrys zamorae Osgood

1904. *Peromyscus melanophrys zamorae* Osgood, Proc. Biol. Soc. Washington, 17:65, March 21, type from Zamora, Michoacán.

MARGINAL RECORDS (Baker, 1952:254).—Hidalgo: Zimapán. Michoacán: Queréndaro; type locality.

Peromyscus mekisturus Merriam
Puebla Deer Mouse

1898. *Peromyscus mekisturus* Merriam, Proc. Biol. Soc. Washington, 12:124, April 30, type from Chalchicomula, 8400 ft., Puebla.

External measurements of the type, an adult female, are 249; 155; 24; 18.4 (dry). Upper parts as in *P. melanophrys*; underparts creamy buff, wholly without white; hind feet dusky to toes, toes white; tail brownish above, mottled brownish and whitish below. Skull of the *melanophrys* type, but smaller; nasals short; frontals much constricted and without supraorbital beading. Tail strikingly long relative to length of head and body.

MARGINAL RECORDS.—Puebla: type locality; Tehuacán, 1700 m. (Hooper, 1947:51). See Map 366.

lepturus-group

Peromyscus lepturus Merriam
Slender-tailed Deer Mouse

1898. *Peromyscus lepturus* Merriam, Proc. Biol. Soc. Washington, 12:118, April 30, type from Mt. Zempoaltepec, 8200 ft., Oaxaca.

External measurements: 218–238; 112–119; 26–28; 16.4–18.2 (dry). Upper parts brownish black lightly sprinkled with cinnamon; sides, shoulders, and head paler; underparts creamy white with slaty basal tones showing through clearly, pectoral region sometimes faintly washed with russet; forefeet white, dusky of hind leg extending onto dorsum of foot, in some specimens to toes; tail either bicolored or uniformly dark. Skull somewhat as in *boylii* group; nasals and palatine slits long; zygomata slightly convergent anteriorly; frontals small, constricted, not beaded; braincase markedly flattened.

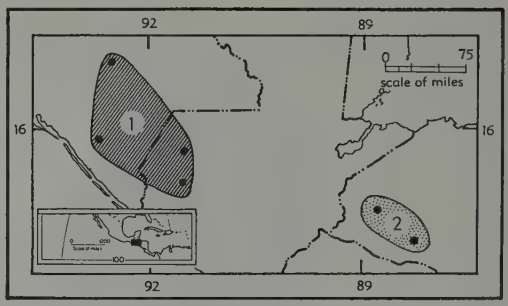
MARGINAL RECORDS.—Oaxaca: Totontepec (Osgood, 1909:192); type locality. See Map 370.

Peromyscus lophurus Osgood
Crested-tailed Mouse

1904. *Peromyscus lophurus* Osgood, Proc. Biol. Soc. Washington, 17:72, March 21, type from Todos Santos, 8500 ft., Huehuetenango, Guatemala.

Average external measurements of 4 adult topotypes are: 208; 105; 24.5; 16 (dry). Upper parts between wood brown and fawn color, with a small dusky area in middle of back; underparts white; tail long, well haired, markedly penicillate, unicolored sepia brown; forefeet white, hind feet dusky or brownish to base of toes, which are white. Skull resembling that of *lepturus*, but smaller and having rostral part decidedly shorter; molar teeth actually about same size, relatively larger; interparietal unusually large (after Osgood, 1909:192).

MARGINAL RECORDS.—Chiapas: San Cristobal [= Ciudad de las Casas] (Osgood, 1909:192). Guatemala: type locality; Calel (*ibid.*). Chiapas: Ambos de Triunfo, 1950 m. (Villa, 1949:516).



Map 369. *Peromyscus lophurus* (1) and *Peromyscus hondurensis* (2).

Peromyscus hondurensis Goodwin
Honduran Deer Mouse

1941. *Peromyscus hondurensis* Goodwin, Amer. Mus. Novit., 1121:1, June 9, type from Muya, a hill about 5 mi. N Chinacla, between 3000–4000 ft., La Paz, Honduras.

External measurements of type (unsexed) and a topotype are, respectively: 213, 215; 102, 107; 24, 24; 17, 17. Upper parts cinnamon brown, darkened along mid-dorsal line with an admixture of black hairs; sides of body bright ochraceous tawny mixed with black, becoming clear tawny along lateral line and on cheeks; hind limb blackish mummy brown above ankle, this color extending below ankle on upperside of foot; forefeet and hind feet white; tail covered with fine short hairs, dusky above, whitish below; underparts white (after Goodwin, 1941:1).

MARGINAL RECORDS.—Honduras: Cerro Pucca, Gracias (Goodwin, 1941:1); type locality.

Peromyscus simulatus Osgood
Jico Deer Mouse

1904. *Peromyscus simulatus* Osgood, Proc. Biol. Soc. Washington, 17:72, March 21, type from near Jico, 6000 ft., Veracruz.

External measurements of the type, an adult, are: 169; 87; 21; 14.3 (dry). Color as in *P. lophurus* but "dark markings of feet and face slightly more intense; tail chiefly brown, but with a narrow line of white on under side" (Osgood, 1909:193). Specimens from Teocelo, Veracruz, here provisionally referred to this species, have distinctly bicolored tails that are brown above and gray below. Skull essentially as in *P. lophurus* but smaller; braincase more inflated; rostrum more depressed; auditory bullae relatively larger; interorbital constriction wider; teeth small.

This species is distinguishable from its congeners by a combination of small size, crested tail, and dark brown feet.

MARGINAL RECORDS.—Veracruz: type locality; Teocelo, 4500 ft. (30481 KU).

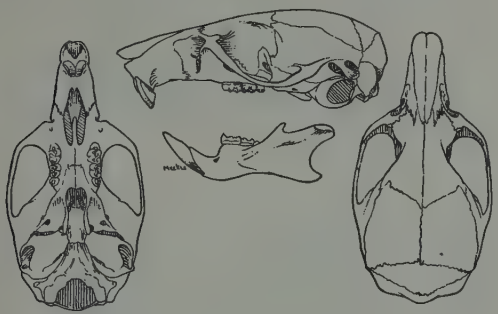


Fig. 359. *Peromyscus simulatus*, Teocelo, 4500 ft., Veracruz, No. 30481 K.U., ♂, X 1½.

Peromyscus guatemalensis
Guatemalan Deer Mouse

External measurements: 252–290; 122–153; 28–34; 16–25. Upper parts approximately ferruginous heavily mixed with dusky, especially middorsally, which imparts an over-all appearance of dark brown to blackish; underparts buffy whitish but with slaty basal color showing through conspicuously; pectoral region washed with cinnamon rufous; forefeet white; hind feet chiefly white but dusky of tarsal joint sometimes extending over as much as half of antiplantar surface of foot; tail usually somewhat bicolored, underside sometimes irregularly blotched with yellowish and dusky, tail sometimes entirely dusky. Skull much as in the *mexicanus*-group, but generally larger; frontals constricted, trenchant supraorbitally but not beaded; pelage of a wooly texture.

This species seems to be restricted to the highlands.

Peromyscus guatemalensis guatemalensis Merriam

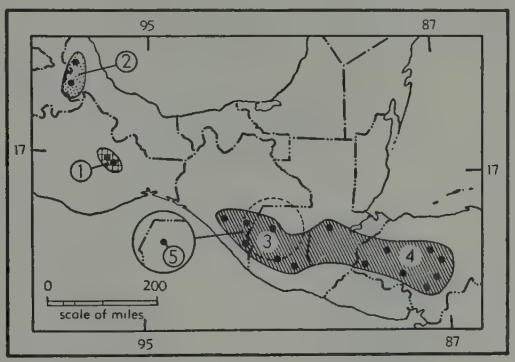
1898. *Peromyscus guatemalensis* Merriam, Proc. Biol. Soc. Washington, 12:118, April 30, type from Todos Santos, 10,000 ft., Huehuetenango, Guatemala.

MARGINAL RECORDS.—Chiapas: Triunfo, 1950 m. (Hooper, 1947:52); Pinabete (Osgood, 1909:195). Guatemala: type locality; Volcán San Lucas (Goodwin, 1934:42); Volcán Santa María (Osgood, 1909:195). Chiapas: Volcán Tacaná, 3000 m. (Villa, 1949:516).

Peromyscus guatemalensis tropicalis Goodwin

1932. *Peromyscus guatemalensis tropicalis* Goodwin, Amer. Mus. Novit., 560:3, September 16, type from Chimoxan, about 40 mi. NE Cobán, Alta Verapaz, 1500 ft., Guatemala.

MARGINAL RECORDS (Goodwin, 1942:162).—Guatemala: type locality. Honduras: Santa Bárbara; El Caliche Orica; Rancho Quemado; La Flor Archaga; Sabana Grande; Muya; Monte Verde.



Map 370. Four species of *Peromyscus*.

Guide to kinds
1. *P. lepturus*
2. *P. simulatus*
3. *P. guatemalensis guatemalensis*
4. *P. guatemalensis tropicalis*
5. *P. altilaneus*

Peromyscus nudipes
Naked-footed Deer Mouse

External measurements: 240–280; 120–140; 26–30; 18.4–22 (dry). Upper parts dark brown to blackish middorsally, sides lighter, richer brown; underparts varying from yellowish white with buffy pectoral suffusion to entirely buffy except for throat and chin; forefeet white; hind feet white above on distal half, dusky proximally; tail usually entirely brownish black but sometimes irregularly blotched below. Skull with narrow braincase; small auditory bullae; occasional faint beading supraorbitally; widely opened palatine slits; zygomata notched slightly anteriorly. Pelage full and soft; tail clothed with short hairs, prominently scaled.

Peromyscus nudipes hesperus Harris

1940. *Peromyscus nudipes hesperus* Harris, Occas. Papers Mus. Zool., Univ. Michigan, 423:1, November 29, type from Hacienda Santa María, 3200 ft., about 15 mi. NE Liberia, Guanacaste, Costa Rica.

MARGINAL RECORDS.—Costa Rica: type locality; [Cerro de] San Juan (Goodwin, 1946:389).

Peromyscus nudipes nudipes (J. A. Allen)

1891. *Hesperomys* (*Vesperimus*?) *nudipes* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:213, April 17, type from La Carpintera, Cartago, Costa Rica.

1894. *Peromyscus nudipes*, Thomas, Ann. Mag. Nat. Hist., ser. 6, 14:365, November.
1902. *Peromyscus cacabatus* Bangs, Bull. Mus. Comp. Zool., 39:29, April, type from Boquete, Chiriquí, Panamá.

MARGINAL RECORDS (Goodwin, 1946:388, unless otherwise noted).—Costa Rica: El Coronel de Carrillo (Osgood, 1909:196); Rancho de Río Jiménez; Volcán Irazú; El Muñeco. Panamá: Boquete, Chiriquí. Costa Rica: San Joaquin; Los Higuerones Escazú.

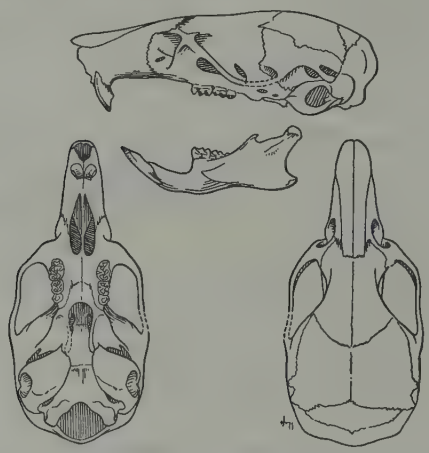
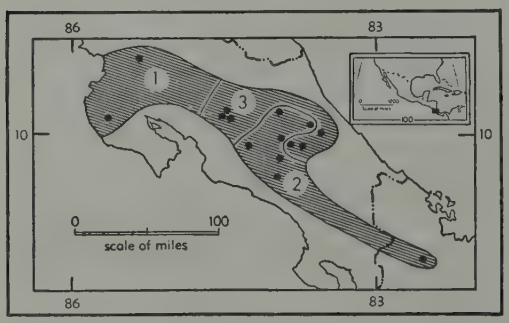


Fig. 360. *Peromyscus nudipes nudipes*, San Rafael, 30 km. S San José, Prov. San José, Costa Rica, No. 39254 K.U., ♂, X 1½.



Map 371. *Peromyscus nudipes*.

1. *P. n. hesperus* 2. *P. n. nudipes* 3. *P. n. orientalis*

Peromyscus nudipes orientalis Goodwin

1938. *Peromyscus nudipes orientalis* Goodwin, Amer. Mus. Novit., 987:3, May 13, type from El Sauce Peralta, about 1000 ft., Cartago, Costa Rica.

MARGINAL RECORDS (Goodwin, 1946:388).—Costa Rica: Western localities: Lajas Villa Quesada; Zarcero; Tapesco. Eastern localities: type locality; Juan Viñas; Cervantes.

Peromyscus altilaneus Osgood
Todos Santos Deer Mouse

1904. *Peromyscus altilaneus* Osgood, Proc. Biol. Soc. Washington, 17:74, March 21, type from Todos Santos, 10,000 ft., Huehuetenango, Guatemala. Known only from the type locality.

External measurements of the type, the only known specimen, are: 228; 115; 28; 20.6 (dry). ". . . scarcely any character can be found distinguishing it from *guatemalensis* except that of size" (Osgood, 1909:198).

Peromyscus furvus J. A. Allen and Chapman
Blackish Deer Mouse

1897. *Peromyscus furvus* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:201, June 16, type from Jalapa, Veracruz.

External measurements: 248–282; 123–145; 26–32; 20–23. Upper parts dark brown to blackish, approximating russet on sides; underparts grayish white with much slaty basal color showing through; feet white; blackish brown marking on tarsal joint; tail either entirely blackish or irregularly bicolored and blotched below. Skull with markedly constricted frontals and lacking supraorbital beading although supraorbital border may be trenchant posteriorly; teeth and auditory bullae much as in *P. guatemalensis*; nasals long and broadly expanded, spoon-shaped anteriorly. Blackish color, lack of supraorbital beading, and markedly expanded nasals are diagnostic.

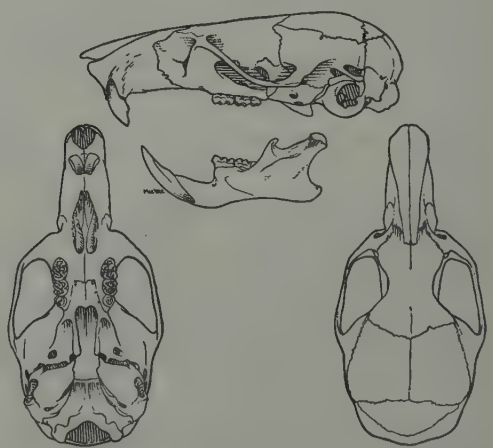


Fig. 361. *Peromyscus furvus*, 2 km. W Jico, 4200 ft., Veracruz, No. 19561 K.U., ♂, X 1½.

MARGINAL RECORDS.—Puebla: Huauchinango (Osgood, 1909:197). Veracruz: 5 km. N Jalapa, 4500 ft. (19543 KU); type locality; *Jico* (Osgood, 1909:197); 2 km. W Jico, 4200 ft. (19551 KU).

Peromyscus latirostris Dalquest
Broad-nosed Deer Mouse

1950. *Peromyscus latirostris* Dalquest, Occas. Papers Mus. Zool., Louisiana State Univ., 23:8, July 10, type from Apetsco, 2700 ft., near Xilitla, San Luis Potosí.

Average external measurements of 9 males and 4 females are, respectively: 265, 278; 134, 143; 31, 31. External measurements of an adult male (41147 KU) are 295, 156, 33, 18. Upper parts dark brown with suffusion of dusky; under parts grayish white with slaty basal tones conspicuous; tail and feet as in *P. furvus*. Skull as in *P. furvus* but with nasals even more expanded distally.

P. latirostris averages paler than *P. furvus*, but otherwise the two species are much alike.

MARGINAL RECORDS (Dalquest, 1950:11).—San Luis Potosí: Xilitla, 2500 ft.; *type locality; Rancho Miramar Grande, 5000 ft.*; Cerro Conejo, 6000 ft.

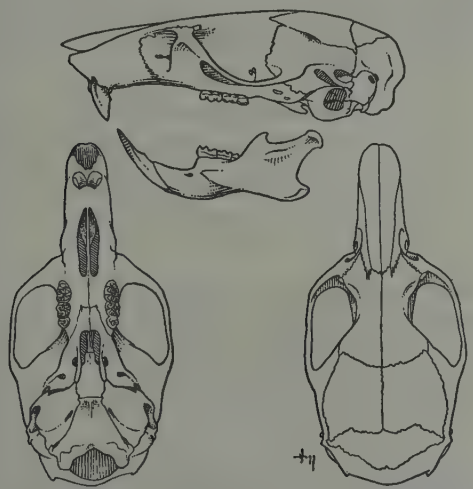
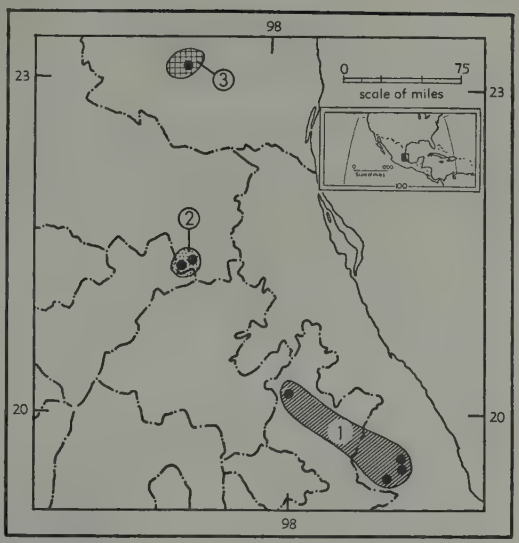


Fig. 362. *Peromyscus latirostris*, Apetsco, near Xilitla, San Luis Potosí, No. 41148 K.U., ♂, X 1½.

Peromyscus ochraventer Baker
El Carrizo Deer Mouse

1951. *Peromyscus ochraventer* Baker, Univ. Kansas Publ., Mus. Nat. Hist., 5:213, December 15, type from 70 km. by highway S Ciudad Victoria, 6 km. W Panamerican Highway at El Carrizo, Tamaulipas.

External measurements: 226–249; 116–128; 24–26; 20–21. Upper parts ochraceous tawny, brighter on



Map 372. Three species of *Peromyscus*.
1. *P. furvus* 2. *P. latirostris* 3. *P. ochraventer*

sides, duller on back; underparts cinnamon buff; brighter on pectoral region; feet white; tail scaly, indistinctly bicolored with dark hairs above, light hairs below. Skull lacking beaded or ridged supraorbital border; rostrum almost parallel-sided; P1 and P2 with well developed outer accessory cusps; anteriormost loph (parastyle-protoconule) of M1 almost as broad as greatest breadth of M1.

This species closely resembles *P. latirostris* and *P. furvus* but is readily distinguished from either by the buffy underparts.

MARGINAL RECORDS.—Tamaulipas (Goodwin, 1954: 12); type locality; *Gómez Farías; Rancho del Cielo; La Joya de Salas.*

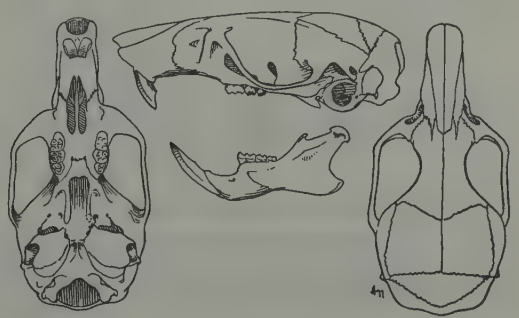


Fig. 363. *Peromyscus ochraventer*, 70 km. S Victoria by highway and 6 km. W highway, Tamaulipas, No. 37039 K.U., ♂, X 1½.

mexicanus-group

Peromyscus mexicanus

Mexican Deer Mouse

External measurements: 191–270; 92–142; 23–29; 17–24. Upper parts dark brown to blackish, usually darkest middorsally; underparts whitish, rarely with buffy suffusion but often with buffy pectoral region; feet white; carpus and tarsus usually dusky; tail almost naked, dark above, blotched with yellowish below. Skull with moderately long rostrum and nasals; braincase arched; frontals narrow; supraorbital borders trenchant and often faintly beaded; zygomata robust, decidedly notched anteriorly in adults; molar teeth and auditory bullae relatively small.

Mexican deer mice are primarily forest dwellers, although specimens, mostly young, are not uncommon in brushy situations along the forest's edge. Within their ecological limits they are among the commonest mammals at a given place. Collectors' field notes indicate that the mice are especially numerous at rocky ledges and boulders, and that the mice are seemingly polyestrous. Two or three embryos seem to be usual.

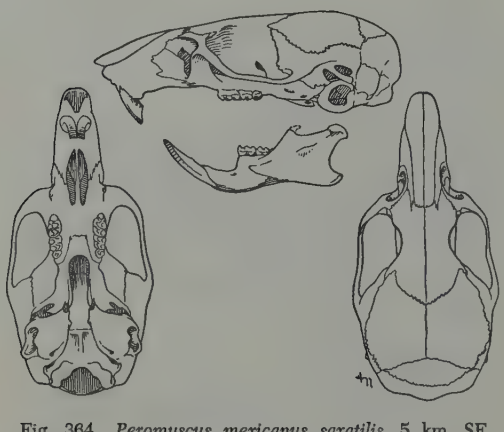


Fig. 364. *Peromyscus mexicanus saxatilis*, 5 km. SE Turrialba, 1950 ft., Prov. Cartago, Costa Rica, No. 26986 K.U., ♂, X 1½.

Peromyscus mexicanus gymnotis Thomas

1894. *Peromyscus gymnotis* Thomas, Ann. Mag. Nat. Hist., ser. 6, 14:365, November, type from Guatemala.
1909. *Peromyscus mexicanus gymnotis*, Osgood, N. Amer. Fauna, 28:205, April 17.

MARGINAL RECORDS.—Chiapas: Huehuetán (Osgood, 1909:206). Guatemala: Finca Ciprés (Goodwin, 1934:44); Hda. California (Goodwin, 1934:44).

Peromyscus mexicanus mexicanus (Saussure)

1860. *H[esperomys]. mexicanus* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:103, Mexico; assumed to be the vicinity of Mirador, Veracruz; restricted to 10 km. E Mirador (Dalquest, Occas. Papers Mus. Zool., Louisiana State Univ., 23:8, July 10, 1950).
1894. *P[eromyscus]. mexicanus*, Thomas, Ann. Mag. Nat. Hist., ser. 6, 14:364, November.
1898. *Peromyscus tehuantepecus* Merriam, Proc. Biol. Soc. Washington, 12:122, April 30, type from Tehuantepec, Oaxaca (Goodwin, Amer. Mus. Novit., 1732:2, June 10, 1955, implies that *tehuantepecus* is a valid subspecies of *P. mexicanus*, and lists specimens from Ixcuintepec, Oaxaca).

MARGINAL RECORDS (Osgood, 1909:201, unless otherwise noted).—San Luis Potosí: 10 km. E Platanito (Dalquest, 1953b:152). Puebla: Metlaltoyuca. Veracruz: 3 km. W Gutiérrez Zamora, 300 ft. (24250 KU), thence south along coast to Catemaco. Chiapas: Ocuilapa; 10–11 km. W Tuxtla Gutiérrez, 800 m. (Hooper, 1947:52); mountains near Tonalá. Oaxaca: near Tehuantepec; Lagunas. Veracruz: Achotal; Otatitlán; Río Atoyac, 8 km. NW Potrero (18083 KU); Jico. San Luis Potosí: Xilitla (Dalquest, 1953b:152).

Peromyscus mexicanus philombrius Dickey

1928. *Peromyscus mexicanus philombrius* Dickey, Proc. Biol. Soc. Washington, 41:3, January 25, type from Los Esesmiles, 8000 ft., Chalatenango, El Salvador. Known only from the type locality.

Peromyscus mexicanus salvadorensis Dickey

1928. *Peromyscus mexicanus salvadorensis* Dickey, Proc. Biol. Soc. Washington, 41:4, January 25, type from Mt. Cacaguatique, 3500 ft., San Miguel, El Salvador.

MARGINAL RECORDS.—El Salvador (Dickey, 1928:5): type locality; Volcán Conchagua, 3300–3500 ft.

Peromyscus mexicanus saxatilis Merriam

1898. *Peromyscus mexicanus saxatilis* Merriam, Proc. Biol. Soc. Washington, 12:121, April 30, type from Jacaltenango, 5400 ft., Huehuetenango, Guatemala.
1908. *Peromyscus nicaraguae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:649, October 13, type from Matagalpa, Matagalpa, Nicaragua.

MARGINAL RECORDS.—Chiapas (Osgood, 1909:204): San Bartolomé; San Vicente. Guatemala (Goodwin, 1934:43): Chanquejelve; Finca Concepción. Honduras: Cantoral (Goodwin, 1942:162). Nicaragua: San Rafael del Norte (J. A. Allen, 1910:100). Costa Rica: 5 km. SE Turrialba (26986 KU). Nicaragua: Matagalpa (J. A. Allen, 1910:100). Honduras (Goodwin, 1942:162): Sabana Grande; Monte Linderos; Cerro Pucca. Guatemala (Goodwin, 1934:43): Tecpán; La Primavera. Chiapas: Chicharras (Osgood, 1909:204); Catarina, 1300 m. (Villa, 1949:514).

Peromyscus mexicanus teapensis Osgood

1904. *Peromyscus mexicanus teapensis* Osgood, Proc. Biol. Soc. Washington, 17:69, March 21, type from Teapa, 800 ft., Tabasco.

Map 373. *Peromyscus mexicanus.*

Guide to subspecies
1. *P. m. gymnotis*
2. *P. m. mexicanus*
3. *P. m. philombrius*
4. *P. m. salvadorensis*
5. *P. m. saxatilis*
6. *P. m. teapensis*
7. *P. m. totontepecus*

MARGINAL RECORDS (Osgood, 1909:205, unless otherwise noted).—Veracruz: 14 km. SW Coatzacoalcos, 100 ft. (19646 KU). Tabasco: Montecristo. Chiapas: 6 mi. SE Palenque (Kuns and Tashian, 1954:102); *Laguna Ocotal* (Burnett and Lyman, 1957:295). Tabasco: near El Salto; type locality.

Peromyscus mexicanus totontepecus Merriam

1898. *Peromyscus mexicanus totontepecus* Merriam, Proc. Biol. Soc. Washington, 12:120, April 30, type from Totontepec, 6500 ft., Oaxaca.

1898. *Peromyscus mexicanus orizabae* Merriam, Proc. Biol. Soc. Washington, 12:121, April 30, type from Orizaba, Veracruz.

MARGINAL RECORDS (Osgood, 1909:203, unless otherwise noted).—Veracruz: 7 km. W El Brinco, 800 ft. (30496 KU); Cautlapán, 4000 ft. (30514 KU); Motzorongo. Oaxaca: mountains near Santo Domingo; Santo Domingo; type locality. Veracruz: Orizaba.

Peromyscus allophylus Osgood
Huehuetán Deer Mouse

1904. *Peromyscus allophylus* Osgood, Proc. Biol. Soc. Washington, 17:71, March 21, type from Huehuetán, 200 ft., Chiapas.

External measurements of the type, an adult female, are: 202; 95; 25; 17 (dry). Upper parts dark

brown heavily mixed with blackish, especially middorsally; underparts yellowish white with slaty basal color conspicuous; tail unicolored blackish; feet with short, sparse, almost-white hairs; tarsi and carpi dusky. Skull differing from that of *P. mexicanus* in slight infraorbital notch, shorter nasals, lack of supraorbital ridge, smaller auditory bullae. Tail shorter than head and body.

The systematic position of this species is unknown; Osgood (1909:207) tentatively placed it in the *mexicanus*-group.

MARGINAL RECORDS.—Chiapas: Finca Liquidámbar, 1210 m. (Villa, 1949:514); Finca Esperanza, 150 m. (Hooper, 1947:52); type locality; Paval, 20 km. by road NE Mapastepec (Villa, 1949:514).

Peromyscus banderanus
Michoacán Deer Mouse

External measurements: 216–277; 109–143; 24–28; 16–19 (dry). Upper parts ochraceous buff with a light mixture of dusky; underparts creamy and usually with buffy pectoral spot; orbital ring and spot at base of vibrissae brown; feet white; tail dusky above, whitish below, distal scaly portion also sometimes bicolored but more commonly blotched with dusky and yellowish. Skull narrow, elongate; posterior part of braincase especially elongate; supraorbital beading pronounced, forming trenchant shelf bounded medially by distinct groove; lacrimal region swollen; auditory bullae relatively small. Pelage soft and short; hind feet naked to calcaneum.

This species is distinguishable from its congeners by the combination of large size, naked soles of hind feet, buffy color, and long, narrow, beaded skull.

Fig. 365. *Peromyscus banderanus vicinior*, 3.2 km. SSE Iguala, 970 meters, Guerrero, No. 28367 K.U., ♀, X 1⅛.

Peromyscus banderanus angelensis Osgood

1904. *Peromyscus banderanus angelensis* Osgood, Proc. Biol. Soc. Washington, 17:69, March 21, type from Puerto Angel, Oaxaca.

MARGINAL RECORDS (Osgood, 1909:211).—Oaxaca: Pinotepa; Pluma [Hidalgo]; type locality.

Peromyscus banderanus banderanus J. A. Allen

1897. *Peromyscus banderanus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:51, March 15, type from Valle de Banderas, Nayarit.

MARGINAL RECORDS (Osgood, 1909:209, unless otherwise noted).—Nayarit: Navarrete. Michoacán: Los Reyes (Hall and Villa, 1950:201); Zitácuaro (*ibid.*); 6 mi. from Apatzingán (Osgood, 1945:300). Guerrero: ¾ mi. E Coalcomán (Hooper, 1955:20); El Limón; Río Aguacatillo, 30 km. N Acapulco, 1000 ft. (Davis, 1944:397); near Ometepec.

Peromyscus banderanus coatlanensis Goodwin

1956. *Peromyscus banderanus coatlanensis* Goodwin, Amer. Mus. Novit., 1791:7, September 28, type from Agua Sarca, about 3500 ft., approximately 7 km. SW Coatlán, District of Tehuantepec, Oaxaca. Known only from the type locality.

Peromyscus banderanus vicinior Osgood

1904. *Peromyscus banderanus vicinior* Osgood, Proc. Biol. Soc. Washington, 17:68, March 21, type from La Salada, Michoacán.

MARGINAL RECORDS.—Michoacán: type locality; 2½ mi. S, 1 mi. E Tacámbaro, 4700 ft. (Hall and Villa, 1950: 201). Guerrero: 3½ km. SSE Iguala, 970 m. (28367 KU); Acahuizotla (Osgood, 1909:210). Michoacán: La Huacana.

Peromyscus yucatanicus
Yucatán Deer Mouse

External measurements: 208–232; 95–122; 23–26; 15.2–18.3 (dry). Upper parts essentially as in *P. banderanus*; underparts yellowish white, becoming nearly pure white on throat, pectoral spot usually absent; tail as in *P. banderanus*. "While apparently quite distinct, this species is little more than a miniature of *P. mexicanus*. In all general characters except size it shows no marked departure from *mexicanus*. Its slightly blotched tail, slightly beaded skull, small teeth, and small audital bullae readily distinguish it from any species approximating it in size" (Osgood, 1909:212).

Peromyscus yucatanicus badius Osgood

1904. *Peromyscus yucatanicus badius* Osgood, Proc. Biol. Soc. Washington, 17:70, March 21, type from Apazote, Campeche. Known only from the type locality.

Map 374. Several species of *Peromyscus*.

Guide to kinds
1. *P. allophylus*
2. *P. banderanus angelensis*
3. *P. banderanus banderanus*
4. *P. banderanus coatlanensis*
5. *P. banderanus vicinior*
6. *P. yucatanicus badius*
7. *P. yucatanicus yucatanicus*
8. *P. stirtoni*
9. *P. grandis*
10. *P. thomasi*
11. *P. nelsoni*
12. *P. flavidus*
13. *P. pirrensis*

Peromyscus yucatanicus yucatanicus J. A. Allen and Chapman

1897. *Peromyscus yucatanicus* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:8, February 23, type from Chichén-Itzá, Yucatán.

MARGINAL RECORDS.—Quintana Roo: Cozumel [Island?] (Gaumer, 1917:117); Esmeralda (Hatt and Villa, 1950:235). Yucatán: Calcehtok (*ibid.*).

Peromyscus stirtoni Dickey
Stirton's Deer Mouse

1928. *Peromyscus stirtoni* Dickey, Proc. Biol. Soc. Washington, 41:5, January 25, type from Río Goascorán, 100 ft., 13° 30′ N, La Unión, El Salvador.

Average external measurements of 17 (?) specimens are: 197; 95; 23.7 (Dickey, 1928:5). Upper parts approximating ochraceous buff moderately mixed with dusky hairs; pectoral spot usually absent; tail conspicuously furred, distinctly bicolored. Skull of average size; rostrum fairly heavy; nasals usually truncate posteriorly; supraorbital border markedly trenchant, not beaded, usually not upturned; braincase narrow but not especially produced posteriorly; auditory bullae small; molar tooth-row and especially M3, weak.

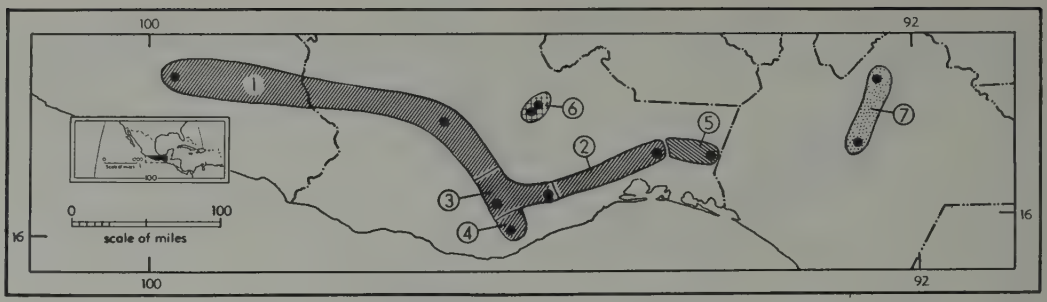
MARGINAL RECORDS.—Honduras: La Piedra de Jesús, Sabana Grande (Goodwin, 1942:163). El Salvador (Dickey, 1928:6): type locality; Pine Peaks, Volcán Conchagua; Lake Olomega; Divisadero.

megalops-group
Peromyscus megalops
Brown Deer Mouse

External measurements: 238–288; 127–150; 26–31; 15.8–23 (dry). Upper parts tawny and blackish brown, darkest middorsally, lightest and clearest on sides; underparts varying from creamy to faintly buffy, pectoral and axillary region usually tawny; feet white; haired part of tail usually bicolored, scaly portion dusky above and blotched below. Skull large and broad; supraorbital border prominent and distinctly beaded; frontal region channeled; lacrimal region swollen; auditory bullae relatively small. Tail decidedly longer than head and body; pelage long, lax.

Peromyscus megalops auritus Merriam

1898. *Peromyscus auritus* Merriam, Proc. Biol. Soc. Washington, 12:119, April 30, type from mountains 15 mi. W City of Oaxaca, 9300 ft., Oaxaca.



Map 375. Three species of *Peromyscus*.

Guide to kinds
1. *P. megalops auritus*
2. *P. megalops azulensis*
3. *P. megalops megalops*
4. *P. megalops melanurus*
5. *P. sloeops*
6. *P. melanocarpus*
7. *P. zarhynchus*

1909. *Peromyscus megalops auritus*, Osgood, N. Amer. Fauna, 28:214, April 17.
1898. *Peromyscus comptus* Merriam, Proc. Biol. Soc. Washington, 12:120, April 30, type from mountains near Chilpancingo, Guerrero.

MARGINAL RECORDS (Osgood, 1909:215).—Guerrero: mountains near Chilpancingo; *Omilteme*. Oaxaca: type locality.

Peromyscus megalops azulensis Goodwin

1956. *Peromyscus megalops azulensis* Goodwin, Amer. Mus. Novit., 1791:6, September 28, type from Cerro Azul, 7000 ft., District of Juchitán, Oaxaca. Known only from the type locality.

Peromyscus megalops megalops Merriam

1898. *Peromyscus megalops* Merriam, Proc. Biol. Soc. Washington, 12:119, April 30, type from mountains near Ozolotepec, Oaxaca.

MARGINAL RECORDS.—Oaxaca: Type locality; Santo Tomás Teipán, 7000 ft. (Goodwin, 1955b:2).

Peromyscus megalops melanurus Osgood

1909. *Peromyscus megalops melanurus* Osgood, N. Amer. Fauna, 28:215, April 17, type from Pluma, 4600 ft., Oaxaca. Known only from type locality.

Peromyscus sloeops Goodwin
Buffy Deer Mouse

1955. *Peromyscus banderanus sloeops* Goodwin, Amer. Mus. Novit., 1732:2, June 10, type from Río Mono Blanco, 3000 ft., 25 km. NE Zanatepec, Oaxaca.
1956. [*Peromyscus*] *sloeops* Goodwin, Amer. Mus. Novit., 1791:7, September 28.

External measurements of two adult males (holotype and a topotype): 247, 277; 127, 143; 28, 28; 16, 19. Greatest length of skull, 33.5, 35.4; zygomatic breadth, 16.3, 16.0; alveolar length of upper molar series, 5.0, 5.0. Pelage buff, long, and lax. From *P. megalops azulensis*, *P. sloeops* differs in: longer tail; buffy instead of blackish coat; white instead of black feet; shorter teeth; less posteriorly-extending supraorbital bead; inflated instead of flat interorbital area.

MARGINAL RECORDS.—Oaxaca (Goodwin, 1955b:2): type locality; *Arroyo Cardón* (10 km. E of the type locality).

Peromyscus melanocarpus Osgood
Zempoaltepec Deer Mouse

1904. *Peromyscus melanocarpus* Osgood, Proc. Biol. Soc. Washington, 17:73, March 21, type from Mt. Zempoaltepec, 8000 ft., Oaxaca.

External measurements of the type, a subadult female, are: 241; 125; 27; 19.2 (dry). An adult male from Totontepec, Oaxaca, measures: 262, 132, 30. Upper parts blackish brown; underparts blackish slate washed with white; tail covered with short blackish hairs little paler below than above; feet dusky brownish to base of toes. Skull much as in *P. megalops*.

The chief diagnostic feature of this species is the dusky feet.

MARGINAL RECORDS.—Oaxaca: type locality; Totontepec (Osgood, 1909:217).

Peromyscus zarhynchus Merriam
Chiapan Deer Mouse

1898. *Peromyscus zarhynchus* Merriam, Proc. Biol. Soc. Washington, 12:117, April 30, type from Tumbalá, 5500 ft., Chiapas.
1898. *Peromyscus zarhynchus cristobalensis* Merriam, Proc. Biol. Soc. Washington, 12:117, April 30, type from San Cristóbal, Chiapas.

External measurements: 303–327; 157–178; 33–38; 21.2–24 (dry). Upper parts dark brown, darkest medially, clearest along sides; underparts pale yellowish white, with or without pectoral spot; feet whitish, proximal part sometimes brownish; tail either bicolored or dusky above and blotched below. Skull large but not especially robust; nasals and rostrum markedly elongate; frontals constricted; supraorbital border trenchant but seldom beaded; lower part of infraorbital plate produced anteriorly.

MARGINAL RECORDS.—Chiapas: type locality; San Cristóbal (Osgood, 1909:218).

Peromyscus grandis Goodwin
Big Deer Mouse

1932. *Peromyscus grandis* Goodwin, Amer. Mus. Novit., 560:4, September 16, type from Finca Concepción, 35 mi. E Cobán, 3750 ft., Alta Verapaz, Guatemala. Known only from the type locality. See Map 374.

External measurements of the type, an adult female, are: 315, 150, 32, 22. Upper parts rich hazel mixed with black, hazel everywhere predominating; middle of back from crown of head to base of tail darker than sides; underparts dull white, strongly overlaid with pinkish cinnamon, especially in pectoral region; fore- and hind-feet creamy white; tail unevenly bicolor, dusky above and irregularly blotched with white below. Skull large, resembling that of *P. zarhynchus*, but general form more massive; rostrum and nasals broader; incisors heavier and molar tooth-rows shorter (after Goodwin, 1932:4–5).

Subgenus Megadontomys Merriam

Revised by Osgood, N. Amer. Fauna, 28:218–222, April 17, 1909.

1898. *Megadontomys* Merriam, Proc. Biol. Soc. Washington, 12:115, April 30. Type, *Peromyscus thomasi* Merriam.

Size large, slightly exceeding next largest species, and greatly exceeding most species of other subgenera of *Peromyscus*; molar teeth largest and heaviest in genus; tubercles of molars low and usually worn flat at early stage; supplementary tubercles (in primary angles of both upper and lower molars) more highly developed than in subgenus *Peromyscus*; first upper molar, when slightly worn, presenting five salient and four re-entrant outer angles; anterior loop of first upper molar, when somewhat more worn, containing a subcircular enamel island, which is persistent part of first outer re-entrant angle; first and second lower molars with prominent and well-developed supplementary enamel loop in outer primary re-entrant angles; plantar tubercles of hind foot 6, as in *Peromyscus*; mammae 6, pectoral $\frac{1}{1}$, inguinal $\frac{2}{2}$ (after Osgood, 1909:218–219).

KEY TO SPECIES OF SUBGENUS MEGADONTOMYS

1. Length of hind foot less than 28.
   2. Anterior tubercle of M1 distinctly divided longitudinally; known only from western Panamá. . . . . *P. flavidus*, p. 656
   2′. Anterior tubercle of M1 scarcely or not at all divided; known only from the State of Guerrero. . . . . *P. thomasi*, p. 655
1′. Length of hind foot more than 28.
   3. Length of hind foot more than 35; supraorbital border of skull beaded; known only from eastern Panamá. *P. pirrensis*, p. 656
   3′. Length of hind foot less than 35; supraorbital border of skull smooth (not beaded); known only from the State of Veracruz. . . . . *P. nelsoni*, p. 656

Peromyscus thomasi Merriam
Thomas' Deer Mouse

1898. *Peromyscus* (*Megadontomys*) *thomasi* Merriam, Proc. Biol. Soc. Washington, 12:116, April 30, type from mountains near Chilpancingo, 9700 ft., Guerrero.

External measurements of 7 adult topotypes are: 310–350; 162–188; 32–34; 21.4–24.8 (dry). Upper parts rich tawny mixed with black, tawny tones predominating; nose, orbital ring, region at base of vibrissae black; underparts creamy white with slate undercolor showing through, sometimes with faint

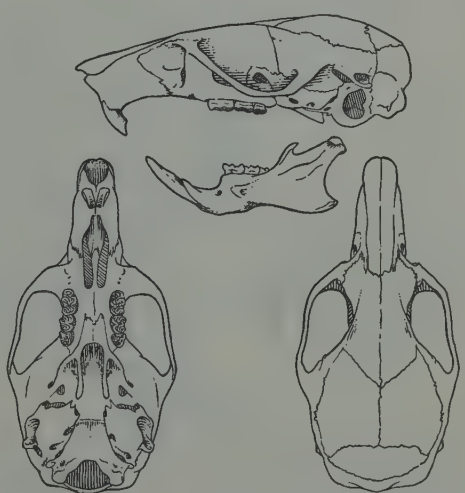


Fig. 366. *Peromyscus thomasi*, 2 km. W Puentecillas, 18 km. SSW Chichichualco, 2500 meters, Guerrero, No. 35250 K.U., ♂, X 1½.

tawny suffusion pectorally; feet white; tail uniformly dusky, but in some specimens mottled with yellowish below. Skull large and massive; supraorbital border markedly beaded; zygomata strongly convergent anteriorly and only slightly notched by infraorbital foramen; interparietal especially large; molars large and massive.

This species has a beaded supraorbital border that is lacking in its closest relative, *P. nelsoni*.

MARGINAL RECORDS.—Guerrero: type locality; 15 km. S Chilpancingo, 9000 ft. (Davis, 1944:398). See Map 374.

Peromyscus nelsoni Merriam
Nelson's Deer Mouse

1898. *Peromyscus* (*Megadontomys*) *nelsoni* Merriam, Proc. Biol. Soc. Washington, 12:116, April 30, type from Jico, 6000 ft., Veracruz. Known only from the type locality. See Map 374.

This species closely resembles *P. thomasi* but lacks the beaded supraorbital ridge.

Peromyscus flavidus (Bangs)
Yellow Deer Mouse

1902. *Megadontomys flavidus* Bangs, Bull. Mus. Comp. Zool., 39:27, April, type from Boquete, Volcán de Chiriquí, Panamá. Known only from the type locality. See Map 374.
1909. *Peromyscus flavidus*, Osgood, N. Amer. Fauna, 28: 221, April 17.

External measurements are: 320–375; 155–205; 31–33; 20–24. Upper parts slightly paler than in *P. thomasi*; underparts more yellowish; forefeet white; hind feet white mixed with brownish to base of toes; tail thinly clothed with short hairs, faintly bicolored. Skull differs from that of *P. thomasi* in being larger, higher, and relatively narrower; rostrum much heavier; premaxillae much more swollen laterally; teeth and auditory bullae actually and relatively smaller; supraorbital beads strongly developed; teeth relatively short and broad; M1 with anterior lamina distinctly divided, making 6 cusps instead of 5 (after Osgood, 1909:222).

This species is only provisionally placed in the genus *Peromyscus*.

Peromyscus pirrensis Goldman
Mt. Pirri Deer Mouse

1912. *Peromyscus pirrensis* Goldman, Smiths. Miscl. Coll., 60(2):5, September 20, type from head Río Limón, Mount Pirri, 4500 ft., Panamá.

External measurements of 6 adult topotypes are: 342–376; 185–204; 36–36.5. Upper parts dark brownish cinnamon to cinnamon rufous lined with black, becoming grayish brown on head and more rusty on rump; sides brighter, more rufescent; underparts dull buffy white, with plumbeous basal color of fur showing through everywhere; nose and upper sides of forearms to near base of toes dusky; toes of forefeet whitish; hind feet whitish more or less clouded with dusky over proximal half of metatarsus; tail brownish and nearly unicolor. Skull resembling that of *P. flavidus* but rostrum less swollen laterally; nasals more attenuate posteriorly; anterior lobe of first upper molar decidedly narrow, its longitudinal notch shown in *flavidus* being faint or absent (after Goldman, 1912:5–6).

MARGINAL RECORDS.—Panamá: type locality; Mt. Tacarcuna (Goldman, 1920:88). See Map 374.

Subgenus Ochrotomys Osgood

Revised by Osgood, N. Amer. Fauna, 28:222–226, April 17, 1909; and by Goldman, Proc. Biol. Soc. Washington, 54: 189–192, December 8, 1941.

1909. *Ochrotomys* Osgood, N. Amer. Fauna, 28:222, April 17. Type *Arvicola nuttalli* Harlan.

Plantar tubercles 6, with a rudimentary seventh adjacent to the large tubercle at base of fifth digit. Mammae 6; inguinal $\frac{2}{2}$, pectoral $\frac{1}{1}$. Posterior palatine foramina farther back than in *Peromyscus*, being decidedly nearer interpterygoid fossa than to posterior endings of anterior palatine slits. Molariform teeth relatively wide, and with enamel folds much compressed; tubercles relatively low; tendency to development of a raised cingulum marked by subsidiary tubercles in inner salient angles of M1 and M2; enamel relatively thicker than in subgenus *Peromyscus*, pattern of occlusal surface in partly worn teeth being much compressed both laterally and longitudinally, with result that folds of two sides touch in almost all stages of wear, leaving five subtriangular islands of dentine in M1 and four in M2; lower molars similarly peculiar (after Osgood, 1909:223).

Peromyscus nuttalli
Golden Mouse

External measurements, 150–190; 68–93; 17–20; 13.4–16.4 (dry). Pelage soft and thick; underparts heavily furred. Upper parts uniformly rich tawny ochraceous; feet and underparts creamy, often washed with ochraceous on venter; tail pale golden brown above, creamy below. Skull relatively broad, braincase inflated; nasals short, compressed posteriorly; interpterygoid fossa truncate anteriorly.

The golden mouse, although widely distributed, is nowhere abundant. Usually it lives in brushy thickets or along weedy borders of fields. The nest is of teacup-size and usually is well above ground in tangled vines or Spanish moss. The species is highly arboreal and the animals move about among the vines and branches freely.

Seemingly golden mice are polyestrous; they breed mainly from April to September.

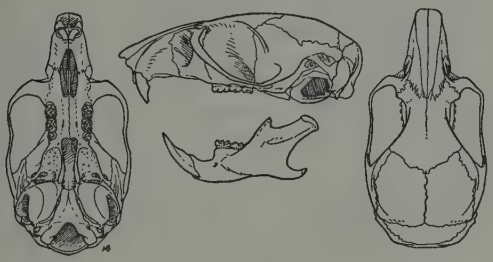


Fig. 367. *Peromyscus nuttalli aureolus*, Chepanoke, Perquimaus Co., North Carolina, No. 54089 M.V.Z., ♂, X 1½.

Peromyscus nuttalli aureolus (Audubon and Bachman)

1841. *Mus* (*Calomys*) *aureolus* Audubon and Bachman, Proc. Acad. Nat. Sci. Philadelphia, 1:98, type from the oak forests of South Carolina.

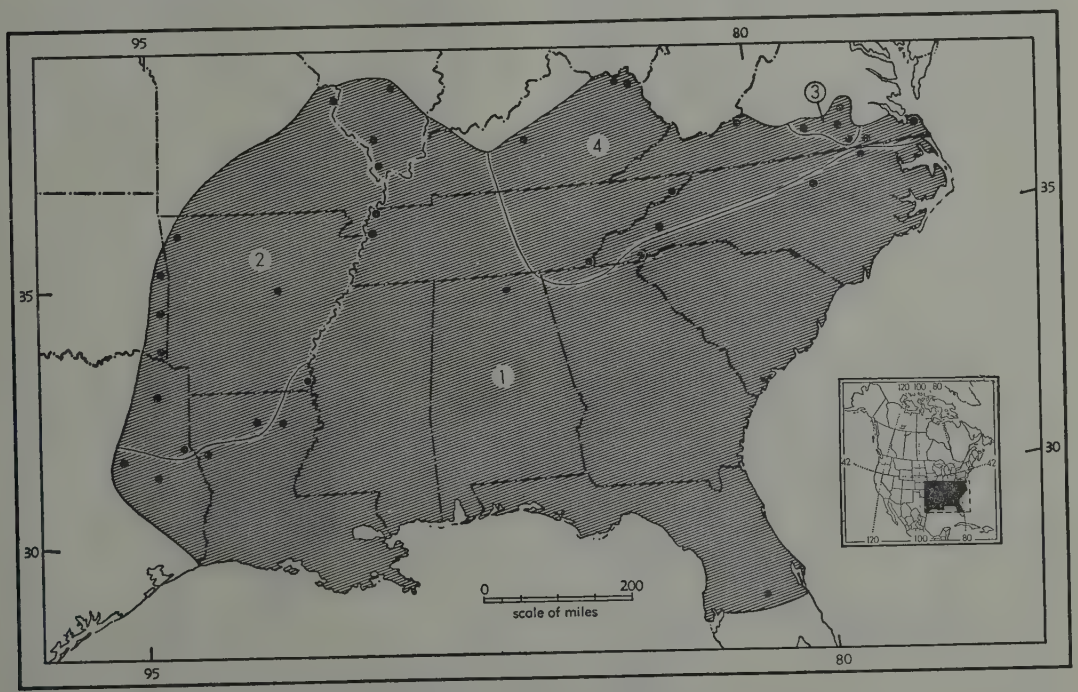
1909. *Peromyscus nuttalli aureolus*, Osgood, N. Amer. Fauna, 28:225, April 17.

MARGINAL RECORDS.—Illinois: Salem (Cory, 1912: 201). Alabama: Huntsville (A. H. Howell, 1921:50). North Carolina: Highlands (Odum, 1949:190); 6 mi. E Chapel Hill (Engels, 1941:447); Apex; Roanoke Rapids (Osgood, 1909:226), thence down coast to Florida: near Davenport (Hill, 1945:88), thence westward along coast to Texas: 20 mi. NW Palestine (McCarley and Bradshaw, 1953:516); 12 mi. NE Lufkin (Baker, 1942:343). Louisiana (Lowery, 1936:28): Mansfield; Monroe. Arkansas: Island No. 80, Chicot Co. (Dellinger and Black, 1940:190). Tennessee: 6½ mi. NE Tiptonville (Goodpaster and Hoffmeister, 1952:367); 1⅘ mi. E Open Lake (*op. cit.*:368). Illinois: Olive Branch (Necker and Hatfield, 1941:53); Murphysboro (Cory, 1912:201).

Peromyscus nuttalli flammeus Goldman

1941. *Peromyscus nuttalli flammeus* Goldman, Proc. Biol. Soc. Washington, 54:190, December 8, type from Delight, Pike Co., Arkansas.

MARGINAL RECORDS (Goldman, 1941:191, unless otherwise noted).—Missouri: St. Louis. Arkansas: Beebe.



Map 376. *Peromyscus nuttalli.*

1. *P. n. aureolus* 2. *P. n. flammeus* 3. *P. n. lewisi* 4. *P. n. nuttalli*

Louisiana: Ruston. Texas: Joaquin; 20 mi. NW Palestine (McCarley and Bradshaw, 1953:516). Oklahoma: 15 mi. SE Broken Bow (Blair, 1939:123; referred to *P. n. aureolus*); 2 mi. W Smithville (*antea*); Redland. Arkansas: ½ mi. W Fayetteville (Dellinger and Black, 1940:190; referred to *P. n. aureolus*).

Lowery (1943:245) recognizes only *P. n. aureolus* as occurring in Louisiana "in view of the confused status of our knowledge of this mouse in Louisiana."

Peromyscus nuttalli lewisi A. H. Howell

1939. *Peromyscus nuttalli lewisi* A. H. Howell, Jour. Mamm., 20:498, November 14, type from Amelia Court House, Amelia Co., Virginia.

MARGINAL RECORDS.—Virginia: Bosher's Dam, James River (Goodpaster and Hoffmeister, 1954:21); type locality; Seward Forest, Triplett (Barbour, 1951:107); Campbell County (Handley and Patton, 1947:166).

Peromyscus nuttalli nuttalli (Harlan)

1832. *Arvicola nuttalli* Harlan, Monthly Amer. Jour. Geol. Nat. Sci., Philadelphia, p. 446, April. Type locality, Norfolk, Norfolk Co., Virginia.

1898. *Peromyscus nuttalli*, Bangs, Proc. Boston Soc. Nat. Hist., 28:197, March.

MARGINAL RECORDS.—Kentucky: 6 mi. E Vanceburg (Goodpaster and Hoffmeister, 1954:22); 10 mi. E Olive Hill (*ibid.*). Virginia: Blacksburg (Patton, 1939:76); Southampton County (Handley and Patton, 1947:165); Norfolk (*ibid.*). Tennessee: Roan Mtn. Station, 2500 ft. (Kellogg, 1939:282). North Carolina: Asheville (Osgood, 1909:225). Tennessee: Poor Fork, Cumberland River, about 4 mi. above Harlan (Barbour, 1951:107). Kentucky: Mammoth Cave National Park, 750 ft. (11135 KU); *1 mi. W Vanceburg* (Goodpaster and Hoffmeister, 1954:22).

Subgenus **Podomys** Osgood

Revised by Osgood, N. Amer. Fauna, 28:226–228, April 17, 1909.

1909. *Podomys* Osgood, N. Amer. Fauna, 28:226, April 17. Type, *Hesperomys floridanus* Chapman.

Plantar tubercles of hind foot 5, instead of 6 as in other subgenera of *Peromyscus*; digital tubercles 3, phalangeal 2, latter much reduced and subcircular; molars slightly more hypsodont than in *Peromyscus* but less so than in *Onychomys*; accessory tubercles in salient interangles of molars small, as seen in transverse section and never forming a loop extending to outer edge of tooth, as in *Peromyscus*; mammae: 6 (i. $\frac{2}{2}$, a. $\frac{0}{0}$, p. $\frac{1}{1}$) (after Osgood, 1909:226–227).

Peromyscus floridanus (Chapman)
Florida Mouse

1889. *Hesperomys floridanus* Chapman, Bull. Amer. Mus. Nat. Hist., 2:117, June 7, type from Gainesville, Alachua Co., Florida.

1896. *Peromyscus floridanus*, Bangs, Proc. Biol. Soc. Washington, 10:122, November 5.

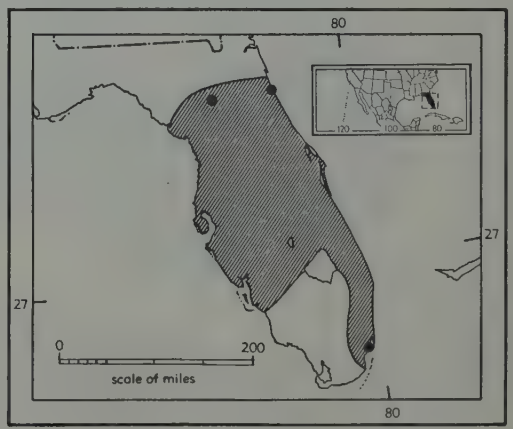
1890. *Hesperomys macropus* Merriam, N. Amer. Fauna, 4:53, October 8, type from Lake Worth, Palm Beach Co., Florida.

External measurements: 186–221; 80–95; 24–29; 22–25. Pelage long, soft, silky. Upper parts bright ochraceous buff, finely mixed with dusky dorsally, clearest on sides; underparts creamy, sometimes with buffy pectoral suffusion; feet white; tail brownish dusky above, white below. Skull large, relatively deep; supraorbital border developed into a shelf; palatine slits short and widely open; interpterygoid fossa wide and truncate anteriorly; molars large and broad.

This species seems to occur only on high well-drained sandy ridges covered with pines and/or palmetto.

MARGINAL RECORDS.—Florida: type locality; Anastasia Island (Pournelle and Barrington, 1953:135); Miami (Sherman, 1937:118).

Fig. 368. *Peromyscus floridanus*, 20 mi. SW Orlando, Orange Co., Florida, No. 96832 M.V.Z., ♂, X 1½.



Map 377. *Peromyscus floridanus*.

Genus Baiomys True—Pygmy Mice

Revised as a subgenus of *Peromyscus* by Osgood, N. Amer. Fauna, 28:252–260, April 17, 1909.

1894. *Baiomys* True, Proc. U.S. Nat. Mus., 16:758, February 7. Type, *Hesperomys taylori* Thomas.

External measurements: 87–135; 34–56; 12.5–17; 8–12 (dry). Length of skull, 16.5–21.5; zygomatic breadth, 8.7–11.5; breadth of cranium, 8.3–10.0. Upper parts blackish sepia to ochraceous-buff; underparts slaty gray to white or pale buffy. Coronoid process of mandible large, broad, and strongly recurved; accessory cusps of M1 and M2 small and not obvious in transverse view until well worn.

Baiomys differs from *Peromyscus* (of which it was formerly classified as a subgenus) in being smaller, having relatively smaller and more rounded ears, and in shape of the coronoid process. These mice make runways, and live together amicably in captivity; both parents share in caring for the young.

This genus is in need of study, and the ranges of the subspecies, as mapped, are provisional.

Key to Species of Baiomys

1. Occurring north of 21° latitude. *B. taylori*, p. 659
1′. Occurring south of 21° latitude.
  2. Occurring south of 18° latitude. *B. musculus*, p. 661
  2′. Occurring between 18° and 21° latitude.
    3. Color grayish, ear (fresh) less than 12.5 *and* hind foot less than 15.5; greatest length of cranium 19 or less. *B. taylori*, p. 659
    3′. Color brownish, ear (fresh) more than 11.5 *and* hind foot more than 15; greatest length of cranium more than 19. . . . . *B. musculus*, p. 661

Baiomys taylori
Northern Pygmy Mouse

External measurements: 87–123; 34–53; 13.4–15; 8–10.3 (dry). Greatest length of skull, 16.5–19; zygomatic breadth, 8.7–10.3. Upper parts pale drab to almost black; underparts grayish to cream-buff. Northern pygmy mice have 1–5 (average, 2.7) young per litter and breed throughout the year.

Baiomys taylori allex (Osgood)

1904. *Peromyscus allex* Osgood, Proc. Biol. Soc. Washington, 17:76, March 21, type from Colima, Colima.
1909. *Peromyscus taylori analogus* Osgood, N. Amer. Fauna, 28:256, April 17, type from Zamora, Michoacán.

MARGINAL RECORDS (Osgood, 1909:257, unless otherwise noted).—Nayarit: Tepic; 1 mi. E Ixtlán del Río, 3700 ft. (40031 KU). Jalisco: 2 mi. NNW Magdalena (Hooper, 1955:13); Ameca; 3 mi. W La Venta (31404 KU); 4 mi. W Guadalajara (31417 KU); 7 *mi. NNW Tepatitlán* (Hooper, 1955:13); 6 mi. N, 4 mi. E Tepatitlán, 6400 ft. (34376 KU). Guanajuato: 5 mi. E Celaya, 6000 ft. (49514 KU). Querétaro: 6 mi. E Querétaro, 6550 ft. (49521 KU). Hidalgo: Tula (56124 CNHM). México: Templo del Sol, Pyramids de San Juan Teotihuacán, 8000 ft. (17992 KU); 4 km. ENE Tlalmanalco, 2290 m. (28110 KU). Distrito Federal: Rancho La Noria, 1 mi. W Xochimilco, 2270 m. (28082 KU); Tepepan (Hooper, 1947:50). Michoacán: Pátzcuaro; Los Reyes. Jalisco: Platanar. Colima: 4 mi. SW Colima, 1400 ft. (40034 KU). Jalisco: 2 mi. SSE Autlán (31520 KU); 13 mi. E, 1 mi. N Talpa de Allende (38452 KU). Nayarit: 3 mi. NNW Las Varas, 150 ft. (40029 KU).

Baiomys taylori ater Blossom and Burt

1942. *Baiomys taylori ater* Blossom and Burt, Occas. Papers Mus. Zool., Univ. Michigan, 465:2, October 8, type from 7 mi. W Hereford, Cochise Co., Arizona.

MARGINAL RECORDS (Hoffmeister, 1956a:281).—1½ mi. SW Fort Grant; type locality.

Baiomys taylori paulus (J. A. Allen)

1903. *Peromyscus paulus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:598, November 12, type from Río Sestín, northwestern Durango.
1912. *Baiomys taylori paulus*, Miller, Bull. U.S. Nat. Mus., 79:137, December 31.

MARGINAL RECORDS (Osgood, 1909:256, unless otherwise noted).—Chihuahua: Casas Grandes; 7 mi. W El Sanz (Blossom and Burt, 1942:4); 5 mi. SE Chihuahua (*ibid.*). Durango: 14 mi. E Zarca (*ibid.*); 1 mi. N Chorro, 6450 ft. (49483 KU). Zacatecas; Valparaíso (recorded as *Peromyscus* [= *Baiomys*] *musculus* by Osgood, 1909:258, but reclassified as *B. taylori paulus* by O. Webb, *in verbis*). Aguascalientes: 1 mi. N Chicalote (Blossom and Burt, 1942:4, as *B. taylori* subsp.). Guanajuato: 4 mi. N, 5 mi. W León, 7000 ft. (49484 KU). Jalisco: Atemajac; Etzatlán. Nayarit: Acaponeta. Sinaloa: Mazatlán; Culiacán (recorded as *Peromyscus* [= *Baiomys*] *musculus* by Osgood, 1909:258, but reclassified as *B. taylori paulus* by O. Webb, *in verbis*). Sonora: 10% mi. SE Ciudad Obregón (Blossom and Burt, 1942:4, as *B. taylori* subsp.).

Baiomys taylori subater (V. Bailey)

1905. *Peromyscus taylori subater* V. Bailey, N. Amer. Fauna, 25:102, October 24, type from Bernard Creek, near Columbia, Brazoria Co., Texas.

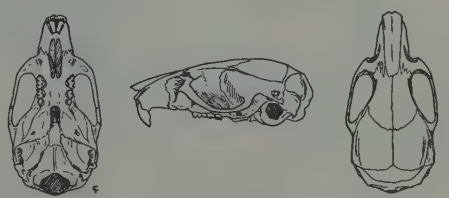


Fig. 369. *Baiomys taylori allex*, 23 km. E Mexico City, México, No. 99873 M.V.Z., ♂, X 1½.

1912. *Baiomys taylori subater,* Miller, Bull. U. S. Nat. Mus., 79:137, December 31.

MARGINAL RECORDS.—Texas: Huntsville (Taylor and Davis, 1947:56); 7 mi. S La Belle (Blossom and Burt, 1942:4); Virginia Point (Osgood, 1909:255); type locality; 4 mi. NNE Yoakum (17987 KU); 5 mi. N Eagle Lake (24881 KU).

Baiomys taylori taylori (Thomas)

1887. *Hesperomys* (*Vesperimus*) *taylori* Thomas, Ann. Mag. Nat. Hist., ser. 5, 19:66, January, type from San Diego, Duval Co., Texas.

1907. *Baiomys taylori,* Mearns, Bull. U.S. Nat. Mus., 56: 381, April 13.

MARGINAL RECORDS (Osgood, 1909:254, unless otherwise noted).—Texas: Boerne; 7 mi. SE Luling (Blair, 1952:242); Matagorda Peninsula; Rockport; thence southward along coast to Veracruz: Tampico Alto, 50 ft. (30151 KU); Cerro Azul, 350 ft. (30155 KU); Potrero Llano, 350 ft. (30159 KU); Acultzingo (Hooper, 1952c:90). San Luis Potosí: Hacienda Capulín (Dalquest, 1953b:157); 10 km. E, 2 km. N Ciudad del Maíz (*ibid.*). Tamaulipas: Hidalgo. Nuevo León: Santa Catarina. Coahuila: 6 mi. SW San Gerónimo (35928 KU).

Map 378. *Baiomys taylori.*

1. *B. t. allex* 2. *B. t. ater* 3. *B. t. paulus* 4. *B. t. subater* 5. *B. t. taylori*

Baiomys musculus
Southern Pygmy Mouse

External measurements: 110–135; 40–56; 14.5–17; 9.8–12 (dry). Greatest length of cranium, 19.2–21.3; zygomatic breadth, 10.1–11.5. Upper parts dark reddish brown to ochraceous-buff; underparts pale pinkish-buff to white or pale buffy. The number of embryos in eight females averaged 2.0 (1–3).

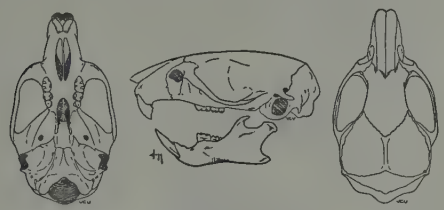


Fig. 370. *Baiomys musculus brunneus*, 7 km. NNW Cerro Gordo, Veracruz, No. 24320 K.U., ♀, X 1½.

Baiomys musculus brunneus (J. A. Allen and Chapman)

1897. *Peromyscus musculus brunneus* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:203, June 16, type from Jalapa, Veracruz.
1912. *Baiomys musculus brunneus*, Miller, Bull. U.S. Nat. Mus., 79:137, December 31.

MARGINAL RECORDS.—Veracruz: type locality; 7 km. NNW Cerro Gordo (24311 KU); Potrero Viejo, 1700 ft. (24338 KU); 3 km. SE Orizaba, 5500 ft. (19405 KU); Texolo [= Teocelo] (Osgood, 1909:259).

Baiomys musculus grisescens Goldman

1932. *Baiomys musculus grisescens* Goldman, Proc. Biol. Soc. Washington, 45:121, July 30, type from Comayabuela [= Comayaguela], 3100 ft., just S of Tegucigalpa, Honduras.

MARGINAL RECORDS (Goodwin, 1942:161).—Honduras: Cementario; Monte Redondo; El Caliche, Cedros. Nicaragua: San Rafael del Norte; Matagalpa. Honduras: El Zapote, Sabana Grande; type locality.

Baiomys musculus infernatis Hooper

1952. *Baiomys musculus infernatis* Hooper, Jour. Mamm., 33:96, February 18, type from Teotitlán, Oaxaca.

MARGINAL RECORDS (Hooper, 1952c:97).—Puebla; Tepanco, 6000 ft.; Tehuacán, 5400 ft. Oaxaca: type locality.

Baiomys musculus musculus (Merriam)

1892. *Sitomys musculus* Merriam, Proc. Biol. Soc. Washington, 7:170, September 29, type from Colima, Colima.
1907. *Baiomys musculus*, Mearns, Bull. U.S. Nat. Mus., 56: 381, April 13.

MARGINAL RECORDS (Osgood, 1909:258, unless otherwise noted).—Jalisco: 7 mi. W Ameca, 4300 ft. (Hooper, 1952c:97); 13 mi. S, 15 mi. W Guadalajara (33557 KU); 2 mi. N Ciudad Guzmán, 5000 ft. (36753 KU); Los Canoas (J. A. Allen, 1906:247). Michoacán: 1¾ mi. S Tacámbaro, 5700 ft. (Hall and Villa, 1949:460); 12 mi. S Tzitzio, 3400 ft. (Hooper, 1952c:97); San José Purua (54084 CNHM). Guerrero: Chilpancingo, 4000 ft. (Hooper, 1952c:97); Tlapa; Tlalixtaquilla. Oaxaca: Oaxaca. Veracruz: Acultzingo (regarded as *B. taylori* by Hooper, 1952c:90, but 61764 CNHM is classified as *B. musculus* by O. Webb); 4 mi. NE Motzorongo, Presidio, 1000 ft. (Hooper, 1952c:97); Puente Nacional, 500 ft. (Davis, 1944:394). Oaxaca: Yalalag; Chicapa; Huilotepec; Juquila; Pinotepa. Guerrero: near Ometepec; Acapulco; Zihuatanejo Bay (Hooper, 1952c:97); El Limón. Michoacán: ½ mi. SE Coalcomán (Hooper, 1955:13). Colima: Armería. Jalisco: Chamela Bay (Hooper, 1952c:97); 4 mi. NE Autlán, 3000 ft. (*ibid.*).

Baiomys musculus nigrescens (Osgood)

1904. *Peromyscus musculus nigrescens* Osgood, Proc. Biol. Soc. Washington, 17:76, March 21, type from Valley of Comitán, Chiapas.
1912. *Baiomys musculus nigrescens*, Miller, Bull. U.S. Nat. Mus., 79:137, December 31.

MARGINAL RECORDS (Osgood, 1909:260, unless otherwise noted).—Chiapas: Bochil, 4300 ft. (Hooper, 1952c:97);

Map 379. *Baiomys musculus.*

1. *B. m. brunneus* 2. *B. m. grisescens* 3. *B. m. infernatis* 4. *B. m. musculus* 5. *B. m. nigrescens* 6. *B. m. pallidus*

16 mi. E Comitán, Las Margaritas, 4000 ft. (Hooper, 1952c: 97). Guatemala: Chanquejelve (Goodwin, 1934:39, as *B. m. musculus*); La Primavera (*op. cit.*:40); Sacapulas (*op. cit.*:39, as *B. m. musculus*). Chiapas: Mapastepec, 200 ft. (Hooper, 1952c:97); Oaxaca: Reforma, 500 ft. (?) (*ibid.*).

Baiomys musculus pallidus Russell

1952. *Baiomys musculus pallidus* Russell, Proc. Biol. Soc. Washington, 65:21, January 29, type from 12 km. NW Axochiapan, 3500 ft., Morelos.

MARGINAL RECORDS (Russell, 1952:22, unless otherwise noted).—Morelos: Tepoztlán; Jonacatepec. Puebla: Acatlán (Osgood, 1909:258); Piaxtla (70260 BSC). Guerrero: 3½ km. SSE Iguala, 970 m. (28334 KU); Chapa, 1470 m. (35345 KU); Texcalzintla, 6 km. NNW Teloloapan, 1530 m. (29472 KU). Morelos: Tetacala (54088 CNHM); Cuernavaca (Osgood, 1909:258).

Genus **Onychomys** Baird—Grasshopper Mice

Revised by Hollister, Proc. U.S. Nat. Mus., 47:427–489, October 29, 1914.

1858. *Onychomys* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):458, July 14. Type, *Hypudaeus leucogaster* Wied-Neuwied.

External measurements: 119–190; 29–62; 17–25; 11–24. Stout mice with short, relatively thick tails; forefeet with 5 plantar tubercles, hind feet with 4; sole of hind foot densely furred from heel to tubercles. Pelage sharply bicolored; underparts white, upper parts variable according to species. Skull with distinctly wedge-shaped nasals, which extend well beyond premaxillary tongues; interorbital constriction narrow; zygomatic plate narrow, straight anteriorly; molars more hypsodont than in *Peromyscus*; M3 reduced; coronoid process of mandible high.

These attractive mice feed mostly on animal material. Much of the diet is insects but grasshopper mice capture and devour other rodents. Because of their dietary regimen, they are almost wholly beneficial to man.

Grasshopper mice become rather gentle in captivity and can be raised easily. They are nocturnal and, to judge from the experience of collectors, rarely abundant. The nest is made in a small burrow, which may have been preempted from some other small mammal. Breeding takes place all year, but mostly in spring and summer. The 2 to 6 blind, helpless, naked young are born after approximately 33 days of gestation.

Much confusion has arisen regarding the colors of *Onychomys* because of the complex nature of the molts. Briefly, the juvenal pelage is an even gray; the adult pelage strongly buffy or tawny; and old individuals often are uniformly gray above, thus closely resembling subadults in color.

Grasshopper mice usually inhabit arid to semiarid scrub deserts.

Key to Species of Onychomys

1. Tail usually less than ½ length of head and body; M3 subcircular in cross-section; M1 less than ½ length of tooth-row.
   O. leucogaster, p. 662
1′. Tail usually more than ½ length of head and body; M3 transversely ovoid in cross-section; M1 more than ½ length of tooth-row.
   O. torridus, p. 665

Onychomys leucogaster
Northern Grasshopper Mouse

External measurements: 130–190; 29–61; 17–25; 13–24. Upper parts brownish to pinkish cinnamon or buffy, most intense along dorsal area; underparts pure white; tail like upper parts in basal two-thirds above, but whitish distally and below. Skull differing from that of *O. torridus* as noted in key to species.

Onychomys leucogaster usually occurs in the Upper Sonoran Life-zone but occasionally is found in the Lower Sonoran or Transition life-zones.

Onychomys leucogaster albescens Merriam

1904. *Onychomys leucogaster albescens* Merriam, Proc. Biol. Soc. Washington, 17:124. June 9, type from Samalayuca, Chihuahua.

MARGINAL RECORDS.—Chihuahua: Mexican boundary line, opposite El Paso, Texas (Hollister, 1914:451); type locality.

Onychomys leucogaster arcticeps Rhoads

1898. *Onychomys arcticeps* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 50:194, May 3, type from Clapham, Union Co., New Mexico.
1914. *Onychomys leucogaster arcticeps*, Hollister, Proc. U.S. Nat. Mus., 47:439, October 29.

MARGINAL RECORDS (Hollister, 1914:441, unless otherwise noted).—Wyoming: 4 mi. N Garland (43920 KU); 6 mi. NW Greybull, 3800 ft. (18282 KU); Bridger Creek; Newcastle. South Dakota: Buffalo Gap; Smithville; Stanley County; Bonesteel (Warren, 1942:192). Nebraska: Callaway. Kansas (Cockrum, 1952:162): 4 mi. N, 3 mi. E Hays, 2000 ft.; Nekoma; Rezeau Ranch, 5 mi. N Belvidere. Texas: Lipscomb; Mobeetie; Fort Lancaster; Monohans. New Mexico: Carlsbad (V. Bailey, 1932:139); Roswell (*ibid.*); Santa Rosa (Warren, 1942:192); near Cimarron (Hill, 1942: 80). Colorado: Westcliffe (Warren, 1942:192); Salida (*ibid.*); Colorado Springs (*ibid.*); Golden; Longmont; Arkins (Cary, 1911:101; recorded as *O. l. pallescens*). Wyoming: Chugwater. Colorado: Canadian Creek. Wyoming: 1 mi. N Encampment, 7100 ft. (26731 KU). Colorado: Craig (Cary, 1911:102; recorded as *O. l. brevicaudus*); Lay; Snake River, 7 mi. N Lily (Cary, 1911:102; recorded as *O. l. brevicaudus*). Wyoming: 33 mi. S Bitter Creek (15505 KU); Mountain View; *Fort Bridger*; Kemmerer; Fontenelle; Big Sandy; 6 mi. W, 2 mi. N Burris, 6450 ft. (32471 KU); 13 mi. N, 1 mi. E Cody, 5200 ft. (37598 KU).

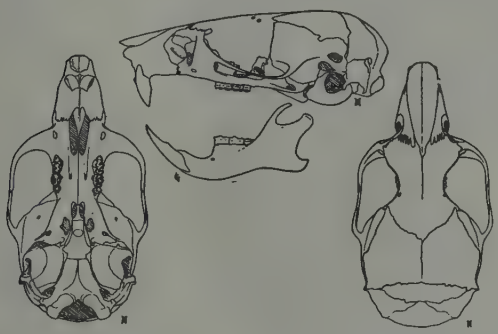


Fig. 371. *Onychomys leucogaster brevicaudus*, 16 mi. NE Iron Point, Nevada, No. 68276 M.V.Z., ♂, X 1½.

Onychomys leucogaster breviauritus Hollister

1913. *Onychomys leucogaster breviauritus* Hollister, Proc. Biol. Soc. Washington, 26:216, December 20, type from Fort Reno, Canadian Co., Oklahoma.

MARGINAL RECORDS.—Iowa: near West Lake Okoboji (Dice, 1924:66). Kansas (Cockrum, 1952:163): Fort Riley; Neosho Falls. Oklahoma: type locality; 14 mi. S Olustee (Blair, 1939:117); Camp Supply (*ibid.*). Kansas: 1 mi. W, 3½ mi. S Kinsley (Cockrum, 1952:163). Nebraska: Neligh (Scott, 1937:74).

Onychomys leucogaster brevicaudus Merriam

1891. *Onychomys leucogaster brevicaudus* Merriam, N. Amer. Fauna, 5:52, July 30, type from Blackfoot, Bingham Co., Idaho.

MARGINAL RECORDS.—Idaho (Davis, 1939:278): Double Springs, 16 mi. NE Dickey; Big Lost River; Blackfoot; Montpelier Creek. Wyoming (Hollister, 1914:443): Cokeville; Evanston. Nevada (Hall, 1946:494): Goose Creek, 2 mi. W Utah boundary, 5000 ft.; Tecoma, 4900 ft.; 3 mi. E Smith Creek Cave, Mt. Moriah, 5500 ft.; 1 mi. N Baker; Coal Valley, 10 mi. N Seeman Pass, 4650 ft.; NW base Timber Mtn., 4200 ft.; 15 mi. NE Tonopah, Ralston Valley, 5800 ft.; Fingerrock Wash, Stewart Valley, 5400 ft. California (Grinnell, 1933:167): Benton; Farrington Ranch, near Mono Lake. Nevada: Gardnerville (Hall, 1946:494). California: Sierra Valley (Hollister, 1914:443); Amedee (Grinnell, 1933:167). Nevada (Hall, 1946:494): 5 mi. N Summit Lake, 5900 ft.; Hot Spring, Thousand Creek, 4300 ft. Idaho (Davis, 1939:278): Murphy; Glenns Ferry.

Onychomys leucogaster capitulatus Hollister

1913. *Onychomys leucogaster capitulatus* Hollister, Proc. Biol. Soc. Washington, 26:215, December 20, type from lower end of Prospect Valley [about 25 mi. WSW Supai, 4500 ft.], Hualpai Indian Reservation, Grand Canyon, Arizona.

MARGINAL RECORDS.—Arizona: type locality; Aubrey Valley, 10 mi. S Pine Spring (Hollister, 1914:450).

Onychomys leucogaster fuliginosus Merriam

1890. *Onychomys fuliginosus* Merriam, N. Amer. Fauna, 3:59, September 11, type from Black Tank lava beds, northeast of San Francisco Mtn., Coconino Co., Arizona.
1913. *O[nychomys]. l[eucogaster]. fuliginosus* Hollister, Proc. Biol. Soc. Washington, 26:216, December 20.

MARGINAL RECORDS.—Arizona: type locality; E side San Francisco Mtn. (Hollister, 1914:448).

Onychomys leucogaster fuscogriseus Anthony

1913. *Onychomys leucogaster fuscogriseus* Anthony, Bull. Amer. Mus. Nat. Hist., 32:11, March 7, type from Ironside, 4000 ft., Malheur Co., Oregon.

MARGINAL RECORDS.—Washington: Baird (Hollister, 1914:444); Coulee City (*ibid.*); Asotin (Dalquest, 1948: 323). Idaho (Davis, 1939:278): Weiser; Nampa. Oregon: Alvord Valley (Hollister, 1914:444). Nevada (Hall, 1946: 493): 8½ mi. E Vya, 5900 ft.; 10 mi. SE Hausen, 4675 ft. California (Grinnell, 1933:167): Box Springs, Madeline Plains, N base Observation Peak; near Tule Lake; Picard, near Lower Klamath Lake. Oregon: Klamath Falls (V. Bailey, 1936:180); Swan Lake Valley (Hollister, 1914:444); Buck Creek (*ibid.*); Willows Junction (*ibid.*). Washington (Dalquest, 1948:323): Yakima; Douglas.

Onychomys leucogaster leucogaster (Wied-Neuwied)

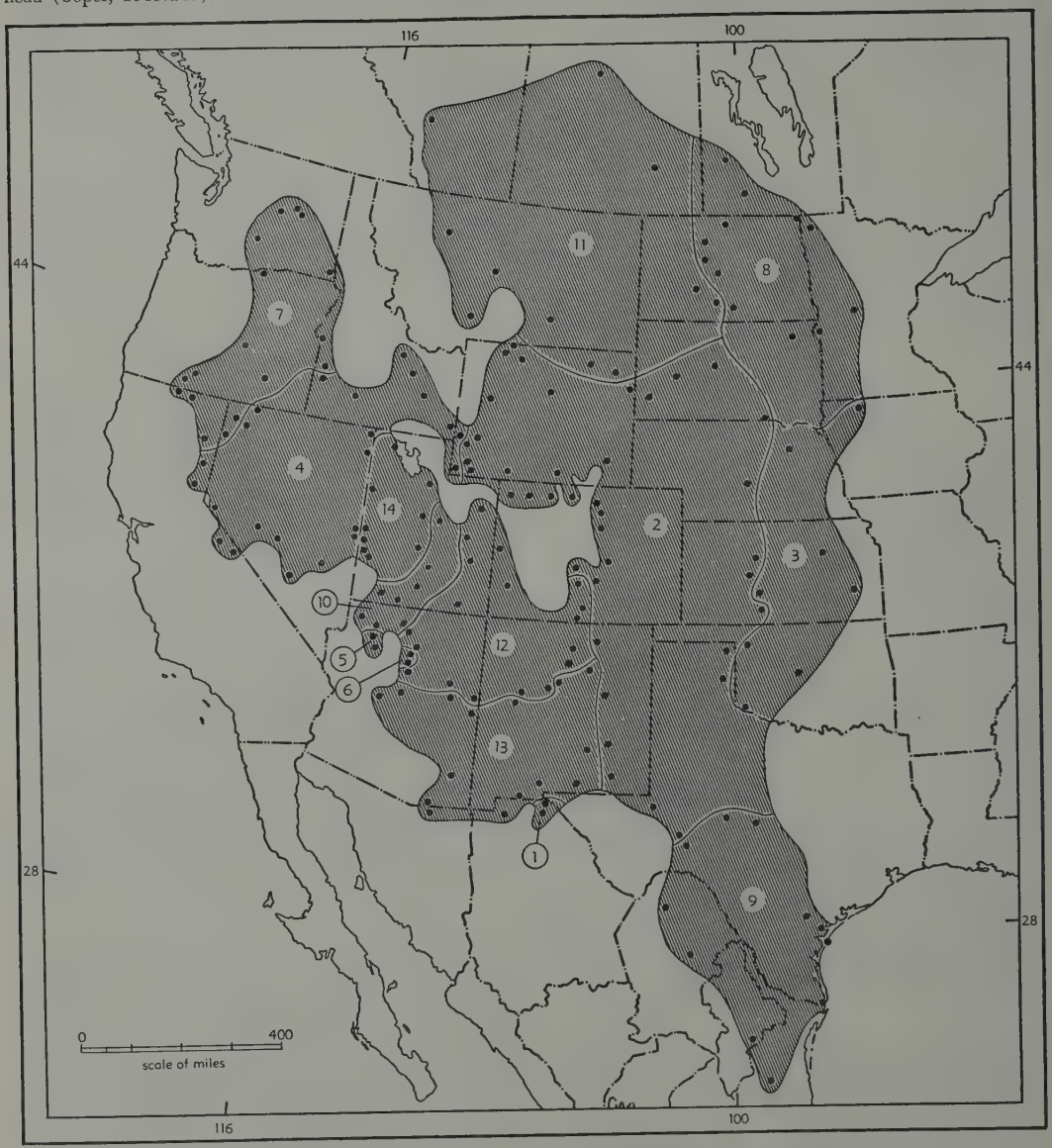
1841. *Hypudaeus leucogaster* Wied-Neuwied, Reise in das innere Nord-America . . . , 2:99, type from Mandan Indian village, near Fort Clark, Oliver Co., North Dakota.
1858. *Onychomys leucogaster*, Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):459, July 14.
1885. *O[nychomys]. leucogaster* var. *pallidus* Herrick, Geol. Nat. Hist. Surv. Minnesota, Ann. Rept. for 1884, p. 183, type from Lake Traverse, near sources of Minnesota and Boix de Siouz rivers, South Dakota.

MARGINAL RECORDS.—Manitoba: border Riding Mtn. National Park (Anderson, 1947:134); Aweme (Soper, 1946: 145). North Dakota: Pembina (Swanson, 1945:85). Minnesota: 4 mi. W Karlstad (Dickerman, 1957:269); Parkers Prairie (Swanson, 1945:85); Brown's Valley (*ibid.*). South Dakota: Waubay Migratory Waterfowl Refuge (262247

BS); *1 mi. W Vermillion* (Findley, 1956b:34). North Dakota: Linton (V. Bailey, 1927:82); type locality; Fort Berthold (*op. cit.*:83); Minot (Anderson, 1947:134); Bottineau (Soper, 1946:145).

Onychomys leucogaster longipes Merriam

1889. *Onychomys longipes* Merriam, N. Amer. Fauna, 2:1, October 30, type from Concho County, Texas.



Map 380. *Onychomys leucogaster.*

Guide to subspecies
1. *O. l. albescens*
2. *O. l. arcticeps*
3. *O. l. breviauritus*
4. *O. l. brevicaudus*
5. *O. l. capitulatus*
6. *O. l. fuliginosus*
7. *O. l. fuscogriseus*
8. *O. l. leucogaster*
9. *O. l. longipes*
10. *O. l. melanophrys*
11. *O. l. missouriensis*
12. *O. l. pallescens*
13. *O. l. ruidosae*
14. *O. l. utahensis*

1913. *Onychomys leucogaster longipes,* Hollister, Proc. Biol. Soc. Washington, 26:216, December 20.

MARGINAL RECORDS.—Texas: San Angelo (Hollister, 1914:453); type locality; 8 mi. N Beeville (Blair, 1952: 243); Rockport (*ibid.*); Mustang Island [18 mi. S Port Aransas] (*ibid.*); Brownsville (*ibid.*). Tamaulipas: Victoria (Hollister, 1914:453. Nuevo León: Linares (*ibid.*). Coahuila: 1 mi. S Hermanas, 1300 ft. (44569 KU); 6 mi. N, 2 mi. E La Babia (35863 KU). Texas: Pecos River, 25 mi. S Sheffield (Hollister, 1914:453).

Onychomys leucogaster melanophrys Merriam

1889. *Onychomys leucogaster melanophrys* Merriam, N. Amer. Fauna, 2:2, October 30, type from Kanab, Kane Co., Utah.

MARGINAL RECORDS.—Utah (Durrant, 1952:327): 2 mi. E Price, thence southward along Green and Colorado rivers to Arizona: 10 mi. S Jacobs Pools (243457 BS); Nixon Spring, W base Mt. Trumbull (262938 BS); Wolf Hole (263192 BS). Utah (Durrant, 1952:327): Zion National Park; 2 mi. N Kanab, 5200 ft.; Bryce National Park; Thurber.

Onychomys leucogaster missouriensis (Aud. and Bach.)

1851. *Mus missouriensis* Audubon and Bachman, The viviparous quadrupeds of North America, 2:327, type from Fort Union near present town of Buford, Williams Co., North Dakota.
1914. *Onychomys leucogaster missouriensis,* Hollister, Proc. U. S. Nat. Mus., 47:438, October 29.

MARGINAL RECORDS.—Saskatchewan (Anderson, 1947:134): Carlton; Indian Head. North Dakota (V. Bailey, 1927:84): Glen Ullin; Cannon Ball. Wyoming (Hollister, 1914:439): Moorcroft; Arvada. Montana (*ibid.*): Fort Custer; Great Falls; Bozeman; Robare. Alberta: Calgary (Anderson, 1947:134).

Onychomys leucogaster pallescens Merriam

1890. *Onychomys melanophrys pallescens* Merriam, N. Amer. Fauna, 3:61, September 11, type from Moki Pueblos, Navajo Co., Arizona.
1895. *Onychomys leucogaster pallescens,* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:225, June 29.

MARGINAL RECORDS (Records marked with an asterisk were recorded as *O. l. melanophrys* following Hollister 1914, who arranged *pallescens* as a synonym of *melanophrys*).—Utah: Kennedys Hole, jct. White and Green rivers (Durrant, Lee and Hansen, 1955:76). Colorado (Warren, 1942:193): Fruita; Coventry; Crestone; Medano Ranch; San Acacio. New Mexico (Hollister, 1914:446): Española*; Santa Fe*; Albuquerque*; [15 mi. S] Acoma*. Arizona: St. Johns (205363 BS); Holbrook* (Hollister, 1914:446); [9 mi. E] Flagstaff* (*ibid.*); 5 mi. SW Cameron (244134 BS); Moencopie Wash, 12 mi. above mouth (226239 BS). Utah (Durrant, 1952:328): Lime Wash, 5 mi. NE Mexican Hat, 4500 ft.; brush flat, Highway 160, 6 mi. N Moab, 4200 ft.; 1 mi. E Green River, 4080 ft.

Onychomys leucogaster ruidosae Stone and Rehn

1903. *Onychomys ruidosae* Stone and Rehn, Proc. Acad. Nat. Sci. Philadelphia, 55:22, May 7, type from Hales Ranch, Ruidoso, Lincoln Co., New Mexico.
1913. *Onychomys leucogaster rudiosae,* Hollister, Proc. Biol. Soc. Washington, 26:216, December 20.

MARGINAL RECORDS.—New Mexico: Las Vegas (Hollister, 1914:449); type locality; Jarilla (V. Bailey, 1932: 140); Mesilla (*ibid.*); Monument No. 15, Mexican boundary line (Hollister, 1914:449). Chihuahua: Colonia Díaz (*ibid.*). Sonora: Río Santa Cruz (Burt, 1938:50). Arizona: Lochiel (Hollister, 1914:449); Willcox (*ibid.*); Kirkland (213458 BS); Camp Verde (Hollister, 1914:449); Taylor (*ibid.*); Springerville (205660 BS). New Mexico (V. Bailey, 1932:140): Burleigh; San Pedro, Sandia Mts.

Onychomys leucogaster utahensis Goldman

1939. *Onychomys leucogaster utahensis* Goldman, Jour. Mamm., 20:354, August 14, type from south end Stansbury Island, 4250 ft., Great Salt Lake, Tooele Co., Utah.
1942. *Onychomys leucogaster aldousi* Goldman, Proc. Biol. Soc. Washington, 55:77, June 25, type from Desert Range Experiment Station, 50 mi. W Milford, Beaver Co., Utah. (Regarded as indistinguishable from *O. l. utahensis* by Durrant, Univ. Kansas Publ., Mus. Nat. Hist., 6:324, August 10, 1952.)

MARGINAL RECORDS (Durrant, 1952:326, unless otherwise noted).—Utah: Kelton; 24 mi. E Salt Lake City, 6500 ft.; Nephi; foothills S of Salina (Stanford, 1931:360; recorded as *O. l. brevicaudus*); Desert Range Experiment Station, 50 mi. W Milford, 5252 ft.; Warm Cove, 55 mi. W Milford, 5500 ft.; 5 mi. S Garrison, 5400 ft.; 4 mi. S Gandy, 4000 ft.; 5 mi. N Ibapah, 5175 ft.

Onychomys torridus
Southern Grasshopper Mouse

External measurements: 119–163; 33–62; 18–23; 11–18. Upper parts grayish or pinkish cinnamon; underparts white; tail above like upper parts in basal ⅔, white below and distally. See key for selected cranial differences between *O. torridus* and *O. leucogaster.*

The southern grasshopper mouse occurs in low, hot valleys, principally in the Lower Sonoran Lifezone.

Onychomys torridus canus Merriam

1904. *Onychomys torridus canus* Merriam, Proc. Biol. Soc. Washington, 17:124, June 9, type from San Juan Capistrano, Zacatecas.

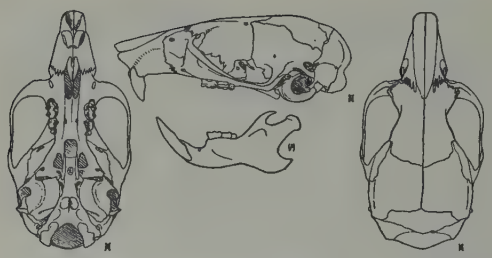


Fig. 372. *Onychomys torridus longicaudus*, ¾ mi. E Crystal Spring, Nevada, No. 52957 M.V.Z., ♂, X 1½.

MARGINAL RECORDS (Hollister, 1914:472, unless otherwise noted).—Zacatecas: type locality; 2 mi. ESE Trancoso, 7000 ft. (40054 KU). San Luis Potosí: 1 km. E Hernández (Dalquest, 1953b:136); 3 km. S Santo Domingo (*ibid.*); 10 mi. NE San Luis Potosí, 6000 ft. (*ibid.*); Río Verde; Jesús María. Aguascalientes: Chicalote.

Onychomys torridus clarus Hollister

1913. *Onychomys torridus clarus* Hollister, Proc. Biol. Soc. Washington, 26:215, December 20, type from Keeler, east shore Owens Lake, Inyo Co., California.

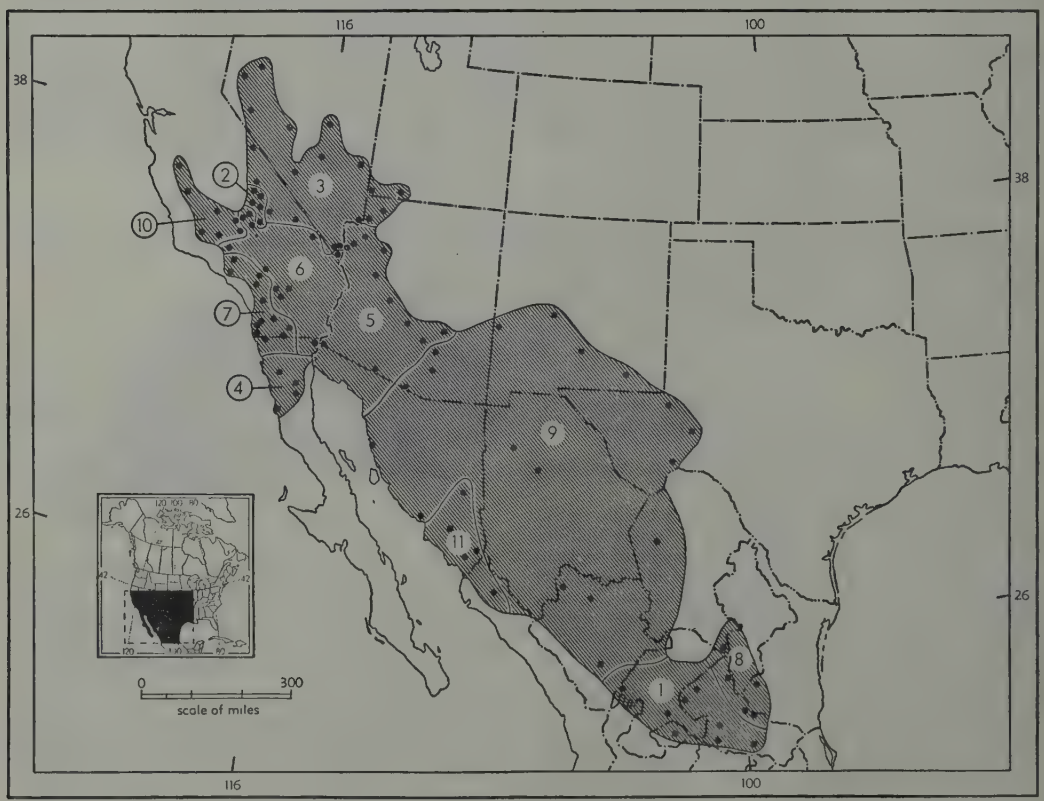
MARGINAL RECORDS (Grinnell, 1933:168).—California: near Lone Pine; type locality; near Coso Mts.; Hot Springs Valley; neighborhood of Olancha.

Onychomys torridus longicaudus Merriam

1889. *Onychomys longicaudus* Merriam, N. Amer. Fauna, 2:2, October 30, type from St. George, Washington Co., Utah.

1904. *O[nychomys]. torridus longicaudus* Merriam, Proc. Biol. Soc. Washington, 17:123, June 9.

MARGINAL RECORDS.—Nevada (Hall, 1946:495–497): 3 mi. NNE Toulon, 3900 ft.; 5½ mi. NE San Antonio, 5700 ft.; 8 mi. NE Springdale, 4250 ft.; Big Creek, 5700 ft., Quinn Canyon Mts.; Railroad Valley, 2¾ mi. S Lock's Ranch,



Map 381. *Onychomys torridus.*

Guide to subspecies
1. *O. t. canus*
2. *O. t. clarus*
3. *O. t. longicaudus*
4. *O. t. macrotis*
5. *O. t. perpallidus*
6. *O. t. pulcher*
7. *O. t. ramona*
8. *O. t. rufus*
9. *O. t. torridus*
10. *O. t. tularensis*
11. *O. t. yakiensis*

5000 ft.; Panaca, 4700 ft. Utah (Durrant, 1952:330): Beaverdam Wash, 2800 ft., 8 mi. N Utah–Arizona border; south boundary Zion National Park. Arizona: 6 mi. N Wolf Hole (243162 BS); Grand Wash, 8 mi. S Pukoon Spring (243164 BS). Nevada (Hall, 1946:497): Cedar Basin, 3500 ft.; Jap Ranch, Colorado River, 14 mi. E Searchlight, 5000 ft.; 9 mi. W, 5½ mi. S Searchlight, 4300 ft. California: Amargosa (Hollister, 1914:465); Maturango Springs (Grinnell, 1933:168); Independence (Hollister, 1914:465); Benton (Grinnell, 1933:168). Nevada (Hall, 1946:495): Cat Creek, 4500 ft., 4 mi. W Hawthorne; 1 mi. NW Fernley, 4090 ft.

Onychomys torridus macrotis Elliot

1903. *Onychomys macrotis* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3(10):155, May 7, type from head San Antonio River, W slope Sierra San Pedro Mártir, Baja California.
1914. *Onychomys torridus macrotis,* Hollister, Proc. U.S. Nat. Mus., 47:469, October 29.

MARGINAL RECORDS (Hollister, 1914:470).—Baja California: El Alamo; Trinidad; type locality; San Quintín.

Onychomys torridus perpallidus Mearns

1896. *Onychomys torridus perpallidus* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 4, May 25 (preprint of Proc. U.S. Nat. Mus., 19:140, December 21, 1896), type from left bank Colorado River at Monument No. 204, Mexican boundary line, Yuma Co., Arizona.

MARGINAL RECORDS (Hollister, 1914:461, unless otherwise noted).—Arizona: Gold Basin, 20 mi. S Gregg's Ferry (227475 BS); Peach Springs (227476 BS); Big Sandy Creek; 5 mi. N Wickenburg (Hatfield, 1942:154); Phoenix; 3 mi. SE Globe (44567 KU); 17 mi. SW Florence (236051 BS); near Gray's Ranch, Organ Pipe Cactus National Monument (Huey, 1942:361); type locality, thence northward east of Colorado River to Harper's; Dolans Spring.

Onychomys torridus pulcher Elliot

1904. *Onychomys pulcher* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):243, January 7, type from Morongo Pass, San Bernardino Mts., California.
1913. *O[nychomys]. t[orridus]. pulcher,* Hollister, Proc. Biol. Soc. Washington, 26:215, December 20.

MARGINAL RECORDS.—California (Grinnell, 1933: 168, unless otherwise noted): Little Lake; Walker Pass; SE side Clark Mtn., 5100 ft. (Johnson *et al.,* 1948:364). Nevada: 8 mi. SSE Dead Mtn., 1900 ft. (Hall, 1946:497), thence southward west of Colorado River to Baja California: Seven Wells (Hollister, 1914:463). California (Grinnell, 1933:168, unless otherwise noted): Palm Springs; Cabezon; type locality; Cushenbury Springs (Hollister, 1914:463); Fairmont, Antelope Valley; Onyx.

Onychomys torridus ramona Rhoads

1893. *Onychomys ramona* Rhoads, Amer. Nat., 27:833, September, type from [Reche Canyon, 1250 ft., 4 mi. SE Colton] San Bernardino Valley, California.
1904. *Onychomys torridus ramona,* Merriam, Proc. Biol. Soc. Washington, 17:124, June 9.

MARGINAL RECORDS (Grinnell, 1933:169, unless otherwise noted).—California: Mint Canyon, 6 mi. W Palmdale (von Bloeker, 1932:78); type locality; Valle Vista; Warner Pass (Hollister, 1914:469); La Puerta Valley; Jacumba. Baja California: Tecarte Valley (Hollister, 1914: 469). California: mouth Tia Juana River; San Diego (Hollister, 1914:469); Santee Mts. (*ibid.*); Riverside (*ibid.*); San Fernando.

Onychomys torridus surrufus Hollister

1914. *Onychomys torridus surrufus* Hollister, Proc. U.S. Nat. Mus., 47:472, October 29, type from Miquihuana, Tamaulipas.

MARGINAL RECORDS.—Coahuila (Baker, 1956:275): *7 mi. S, 4 mi. E Bella Unión;* 8 mi. N La Ventura, 6000 feet; *La Ventura.* Tamaulipas: Jaumave (*ibid.*). San Luis Potosí (Dalquest, 1953b:135): Tepeyac; 7 km. SE Presa de Guadalupe; *Presa de Guadalupe;* 6 km. S Matehuala.

Onychomys torridus torridus (Coues)

1874. *Hesperomys* (*Onychomys*) *torridus* Coues, Proc. Acad. Nat. Sci. Philadelphia, 26:183, December 15, type from Camp Grant, Graham Co., Arizona.
1889. *Onychomys torridus,* Merriam, N. Amer. Fauna, 2:3, October 30.
1896. *Onychomys torridus arenicola* Mearns, Preliminary diagnoses of new mammals from the Mexican border of the United States, p. 3, May 25 (preprint of Proc. U.S. Nat. Mus., 19:139, December 21, 1896), type from Rio Grande, about 6 mi. above El Paso, El Paso Co., Texas.

MARGINAL RECORDS (Hollister, 1914:458–459, unless otherwise noted).—New Mexico: Socorro (V. Bailey, 1932:141); Tularosa (Blair, 1941:224); Carlsbad (V. Bailey, 1932:141). Texas: Monahans; Ft. Lancaster; Maxon Springs. Coahuila (Baker, 1956:276): 18 mi. S and 14 mi. E Tanque Alvarez, 4000 ft.; 3 mi. NW Cuatro Ciénegas. Durango: 4 mi. E Durango, 6200 ft. (38442 KU); Inde; Villa Ocampo. Chihuahua: Gallego; Casas Grandes. Sonora: San José de Guaymas (Burt, 1938:51); ¼ mi. N Puerto Libertad (23241 KU). Arizona: La Osa; near Tucson (V. Bailey, 1932:141); Oracle. New Mexico: Glenwood (V. Bailey, 1932:141).

Onychomys torridus tularensis Merriam

1904. *Onychomys torridus tularensis* Merriam, Proc. Biol. Soc. Washington, 17:123, June 9, type from Bakersfield, Kern Co., California.

MARGINAL RECORDS (Grinnell, 1933:168–169, unless otherwise noted).—California: 11 mi. E Llanda, 1250 ft. (34541 KU); Alila [= Earlimart] (Hollister, 1914:467); Weldon; Kelso Valley; Caliente Creek Wash; Carrizo Plain; Alcalde (Hollister, 1914:467).

Onychomys torridus yakiensis Merriam

1904. *Onychomys torridus yakiensis* Merriam, Proc. Biol. Soc. Washington, 17:124, June 9, type from Camoa, Río Mayo, Sonora.

MARGINAL RECORDS.—Sonora (Burt, 1938:52): Tecoripa; Alamos. Sinaloa: Sinaloa (Hollister, 1914·471). Sonora (Burt, 1938:52): Chinobampo; Obregón.

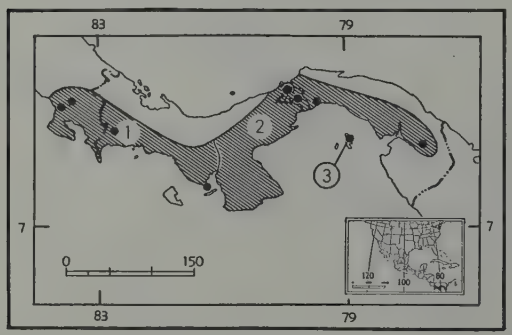
Genus Zygodontomys J. A. Allen—Cane Rats

1897. *Zygodontomys* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:38, March 11. Type, *Oryzomys cherriei* J. A. Allen.

Total length, 217–320; tail, 75–140; hind foot, 26–34. Pelage full and soft, not unlike that of *Sigmodon*; tail shorter than head and body, scantily haired. Interparietal usually large; supraorbital ridges usually well marked; anterior margin of zygomatic plate cut back above; anterior palatine foramina broad, extending to level of tooth-rows; tympanic bullae of moderate size for an oryzomyine rodent; cross furrows between the successive pairs of cusps of molar teeth cut off by longitudinal bar of enamel, yoking together pairs of cusps on median line of tooth; thus anterior cone of M1 connected with two succeeding pairs of cones by median longitudinal ridge, and the two pairs of cones in M2 similarly connected (after J. A. Allen, 1897:38).

KEY TO SPECIES OF ZYGODONTOMYS

1. Underparts gray; nasals more than 14; total length more than 260. . . . Z. *seorsus*, p. 668
1′. Underparts white; nasals less than 14; total length less than 260. . . Z. *cherriei*, p. 668



Map 382. *Zygodontomys.*

Guide to kinds
1. Z. *cherriei cherriei*
2. Z. *cherriei ventriosus*
3. Z. *seorsus*

Zygodontomys cherriei
Cherrie's Cane Rat

External measurements: 217–255; 75–110; 26–28. Upper parts grayish brown, sometimes with yellowish or ochraceous suffusion, darkest middorsally, paler and grayer along flanks; underparts creamy white, hairs plumbeous basally; feet whitish; tail scantily haired, grayish above, whitish below. Skull with short, broad, tapered rostrum; braincase large and moderately inflated. This species occurs from sea level to approximately 2000 feet elevation.

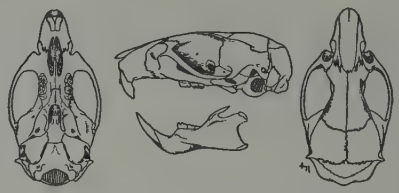


Fig. 373. *Zygodontomys cherriei ventriosus*, Gatún, Canal Zone, Panamá, No. 1360 K.U., ♂, X 1.

Zygodontomys cherriei cherriei (J. A. Allen)

1895. *Oryzomys cherriei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:329, November 8, type from Boruca, Costa Rica.
1897. *Zygodontomys cherriei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:38, March 11.

MARGINAL RECORDS.—Costa Rica: type locality. Panamá (Goldman, 1920:94): Boquerón; Cebaco Island, thence along coast to Costa Rica: Palmar (Goodwin, 1946: 399).

Zygodontomys cherriei ventriosus Goldman

1912. *Zygodontomys cherriei ventriosus* Goldman, Smiths. Miscl. Coll., 56(36):8, February 19, type from Tabernilla, Canal Zone, Panamá.

MARGINAL RECORDS (Goldman, 1920:95).—Panamá: Gatún; Real de Santa María; Old Panamá; Empire.

Zygodontomys seorsus Bangs
San Miguel Cane Rat

1901. *Zygodontomys seorsus* Bangs, Amer. Nat., 35:642, August, type from San Miguel Island, Panamá. Known only from San Miguel Island.

Total length, 275–320; tail, 110–140; hind foot, 30–34. Closely resembling Z. *cherriei* except in: larger size; gray, not white, underparts; yellowish brown, not whitish, feet.

Genus Scotinomys Thomas—Brown Mice

1913. *Scotinomys* Thomas, Ann. Mag. Nat. Hist., ser. 8, 11: 408, April. Type, *Hesperomys teguina* Alston.

External measurements: 129–151; 48–70; 16–19; 12–14. Small blackish-brown, almost unicolored mice with sparsely-haired tail usually shorter than head and body; hind foot narrow. Molars hypsodont; upper molars markedly narrow, M1 especially compressed laterally; folds weak; cusps not prominent; 3 inner roots on m1, 2 on m2, 2 on m3 (*Zygodontomys* has 2, 1, and 1, respectively).

KEY TO NOMINAL SPECIES OF SCOTINOMYS

1. Pelage long, soft, lax; underparts dusky.
   2. Tail more than 68. . . *S. longipilosus*, p. 669
   2′. Tail less than 68.
      3. Tail less than 60; ears not blackish. *S. harrisi*, p. 669
      3′. Tail more than 60; ears blackish. *S. xerampelinus*, p. 669
1′. Pelage short, relatively harsh; underparts buffy brown to reddish brown. *S. teguina*, p. 669

Scotinomys harrisi Goodwin
Savanna Brown Mouse

1945. *Scotinomys harrisi* Goodwin, Amer. Mus. Novit., 1279:3, February 21, type from savanna at Las Vueltas, 8000 ft., Cartago, Costa Rica. Known only from the type locality.

External measurements of the type, an adult male, are: 141; 58; 19; 14. Pelage long, soft, full; upper parts dull blackish brown; underparts washed with buffy tones. Skull large for the genus; rostrum slender; nasals narrow, pointed posteriorly, extending a little beyond premaxillary tongues; braincase high, well inflated; masseteric tubercle of maxilla only faintly developed.

Scotinomys longipilosus Goodwin
Long-furred Brown Mouse

1945. *Scotinomys longipilosus* Goodwin, Amer. Mus. Novit., 1279:2, February 21, type from Volcán Irazú, 9400 ft., Cartago, Costa Rica. Known only from the type locality.

External measurements of the type, an adult male, are: 151; 70; 18 (18.5 dry, *fide* Goodwin, 1946: 413); 13. Pelage long, soft, full; upper parts dark brown, underparts only a trifle lighter. Skull differs from that of *harrisi* in: smaller size and relative narrowness; smaller, less vaulted braincase; smaller teeth; less divergent tooth-rows.

This species is known from only one specimen and hence cannot be described with any degree of assurance.

Scotinomys xerampelinus (Bangs)
Chiriquí Brown Mouse

1902. *Akodon xerampelinus* Bangs, Bull. Mus. Comp. Zool., 39:41, April, type from Volcán de Chiriquí, 10,300 ft., Chiriquí, Panamá. Known only from the type locality.
1913. S[*cotinomys*]. *xerampelinus*, Thomas, Ann. Mag. Nat. Hist., ser. 8, 11:409, April.

External measurements of the type, an old male, are: 145; 65; 17; 14. Pelage long, soft, full; upper parts dark yellowish brown; underparts slightly paler.

Compared with *S. longipilosus*, *xerampelinus* differs in paler underparts and relatively narrower skull. From *harrisi*, *xerampelinus* differs in smaller size, longer tail, blackish rather than somewhat buffy ears.

Scotinomys teguina
Alston's Brown Mouse

External measurements: 129–148; 46–63; 16–19; 12–14. Pelage short and not soft and lax; upper parts blackish brown to reddish brown or auburn; underparts usually but little lighter. Skull essentially as in other species of the genus, differing only in minor, comparative details.

Scotinomys teguina apricus (Bangs)

1902. *Akodon teguina apricus* Bangs, Bull. Mus. Comp. Zool., 39:40, April, type from Boquete, 4000 ft., Chiriquí, Panamá. Known only from the type locality.
1913. S[*cotinomys*]. *teguina apricus*, Thomas, Ann. Mag. Nat. Hist., ser. 8, 11:409, April.

Scotinomys teguina cacabatus Goodwin

1945. *Scotinomys teguina cacabatus* Goodwin, Amer. Mus. Novit., 1279:1, February 21, type from rocky ravines above Villa Quesada, 10 mi. NW Volcán Poás, near Tapesco on main road to San Carlos, 5000 ft., Alajuela, Costa Rica.

MARGINAL RECORDS.—Costa Rica: type locality; *Tapesco* (Goodwin, 1946:408).

Scotinomys teguina endersi Goodwin

1946. *Scotinomys teguina endersi* Goodwin, Bull. Amer. Mus. Nat. Hist., 87:409, December 31, type from Agua Buena, about 3500 ft., locally known as Cañas Gordas but west of the real Cañas Gordas, Savanna de Potrero Grande, Puntarenas, Costa Rica.

MARGINAL RECORDS.—Costa Rica: Boruca (Goodwin, 1946:409); type locality.

Scotinomys teguina episcopi Enders and Pearson

1939. *Scotinomys teguina episcopi* Enders and Pearson, Not. Naturae, Acad. Nat. Sci. Philadelphia, 34:1, November 9, type from Siolo, Río Colorado, tributary of Río Chiriquí Viejo, 10 mi. WNW El Volcán Post Office, 4100 ft., Chiriquí, Panamá.

MARGINAL RECORDS (Goodwin, 1946:411).—Panamá: slopes of Cerro Pando; *Río Santa Clara; type locality.*

Scotinomys teguina escazuensis Goodwin

1945. *Scotinomys teguina escazuensis* Goodwin, Amer. Mus. Novit., 1279:2, February 21, type from Los Higuerónes, 5000 ft., in humid tropical highlands above town of Escazú, San José, Costa Rica.

MARGINAL RECORDS (Goodwin, 1946:409).—Costa Rica: Cervantes; El Copey de Dota; type locality.

Scotinomys teguina garichensis Enders and Pearson

1939. *Scotinomys teguina garichensis* Enders and Pearson, Not. Naturae, Acad. Nat. Sci. Philadelphia, 34:2, November 9, type from Río Gariché, 3200 ft., 5 mi. SW El Volcán Post Office, Chiriquí, Panamá.

MARGINAL RECORDS.—Panamá: Llano Verde (Goodwin, 1946:411); *type locality.*

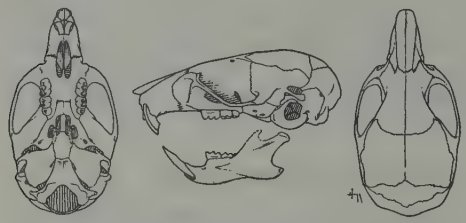


Fig. 374. *Scotinomys teguina irazu*, Volcán Irazú, Costa Rica, No. 116626 U.S.N.M., ♂, X 1½.

Scotinomys teguina irazu (J. A. Allen)

1904. *Akodon irazu* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:46, February 29, type from Volcán de Irazú, Cartago, Costa Rica.

1946. *Scotinomys teguina irazu*, Goodwin, Bull. Amer. Mus. Nat. Hist., 87:410, December 31.

MARGINAL RECORDS (Goodwin, 1946:410).—Costa Rica: type locality; *Altos de Irazú*; Cartago.

Scotinomys teguina leridensis Enders and Pearson

1939. *Scotinomys teguina leridensis* Enders and Pearson, Not. Naturae, Acad. Nat. Sci. Philadelphia, 34:3, November 9, type from Casita Alta, 7000 ft., Finca Larida, Boquete, Chiriquí, Panamá. Known only from the type locality.

Scotinomys teguina rufoniger Sanborn

1935. *Scotinomys teguina rufoniger* Sanborn, Field Mus. Nat. Hist., Publ. 340, Zool. Ser., 20(11):84, May 15, type from mountains W of San Pedro, 4500 ft., Honduras. Known only from the type locality.

Map 383. *Scotinomys.*

Guide to kinds
1. *S. harrisi*
2. *S. longipilosus*
3. *S. xerampelinus*
4. *S. teguina apricus*
5. *S. teguina cacabatus*
6. *S. teguina endersi*
7. *S. teguina episcopi*
8. *S. teguina escazuensis*
9. *S. teguina garichensis*
10. *S. teguina irazu*
11. *S. teguina leridensis*
12. *S. teguina rufoniger*
13. *S. teguina subnubilus*
14. *S. teguina teguina*

Scotinomys teguina subnubilus Goldman

1935. *Scotinomys teguina subnubilus* Goldman, Proc. Biol. Soc. Washington, 48:141, August 22, type from Ocuilapa, 3500 ft., 10 mi. NW Ocozocoautla, and about 25 mi. W Tuxtla Gutiérrez, Chiapas. Known only from the type locality.

Scotinomys teguina teguina (Alston)

1877. *Hesperomys teguina* Alston, Proc. Zool. Soc. London, p. 755, for 1876, April, type from Cobán, Alta Verapaz, Guatemala.

1913. *Scotinomys teguina*, Thomas, Ann. Mag. Nat. Hist., ser. 8, 11:409, April.

MARGINAL RECORDS (Goodwin, 1942:170).—Guatemala: type locality. Honduras: Cerro Pucca; Muya; Monte Verde.

Genus **Sigmodon** Say and Ord—Cotton Rats

Revised by V. Bailey, Proc. Biol. Soc. Washington, 15: 101–116, June 2, 1902.

1825. *Sigmodon* Say and Ord, Jour. Acad. Nat. Sci. Philadelphia, 4(2):352. Type, *Sigmodon hispidus* Say and Ord.

External measurements: 207–365; 75–166; 26–41; approximately 17–25. Body thickset; tail shorter than head and body; ear relatively small; fur short, hispid; 1st and 5th digits of hind foot considerably shorter than 2nd, 3rd and 4th; 6 plantar tubercles. Mammae, 3 pectoral, 2 inguinal, total 10. Skull robust, rostrum well developed; pronounced supraorbital ridges extending posteriorly over temporal region; interparietal broad; zygomatic plate sharply cut back above, with forwardly projecting processes on upper border; . . . incisive foramina extending to tooth-rows; palate broad reaching behind M3; lateral pits well developed; pterygoid fossae unusually deep (after Ellerman, 1941). Upper molars flat-crowned with long, narrow folds surrounded by thick layer of enamel.

Wherever cotton rats occur they usually are the most numerous mammals and are active both day and night. Sometimes they are serious pests in agricultural areas.

The habitat varies somewhat, but usually includes tall weeds or grass. On ditch banks and margins of cultivated fields interlacing runways of cotton rats are used by other small mammals. The food is vegetable matter but animal matter is accepted avidly.

As a group, cotton rats are enormously fecund. The nest is constructed of any vegetation available and even trash is not disdained. The nest is placed in a shallow runway or tunnel.

Because of their day and night activity and great numbers, cotton rats are an important buffer species in prey-predator economics.

Excepting *Sigmodon hispidus*, none of the species of cotton rats is represented by adequate study specimens, and the genus is badly in need of new taxonomic study. Almost certainly many of the named kinds that now stand as species will prove to be only subspecies of more wide-ranging species. In all, there may be no more than six species north of South America. Because of the inadequacy of published material, we have not undertaken to prepare keys that will permit ready identification of most of the nominal species. A key separating *S. hispidus* from members of the *fulviventer*-group is given below. Specimens within the *fulviventer*-group can be identified surely only by direct comparison; they may be tentatively identified by using the descriptions and range maps included below.

KEY TO SPECIES GROUPS OF SIGMODON

1. Tail strongly annulated and nearly naked, the sparse hairs not obscuring annulations; skull relatively long and narrow. . *S. hispidus*, p. 671
1′. Tail less conspicuously annulated, the hairs at least partly obscuring scalation; skull relatively short and broad. *S. fulviventer*-group, p. 676

hispidus-group

Sigmodon hispidus

Hispid Cotton Rat

External measurements: 224–365; 81–166; 28–41; 16–24. Upper parts coarsely grizzled; blackish or dark brownish hairs interspersed with buffy or grayish hairs, varying in over-all tone, according to subspecies; sides usually only slightly paler; underparts usually pale to dark grayish, sometimes faintly washed with buff; tail coarsely annulated, sparsely haired, hairs not obscuring scaly annulations. Skull relatively long and narrow, mastoid breadth usually less than 46 per cent of basal length.

In the central part of the United States, *S. hispidus* recently has extended its geographic range

northward; Cockrum (1948:306–312) shows that the species extended its range northward in Kansas approximately 100 miles in 14 years.

Animals of this species usually are readily distinguishable from those of the *fulviventer*-group in having almost naked tails.

The gestation period of *S. hispidus* is 27 days. Litters vary from from 2 to 12 and average 5 or 6.

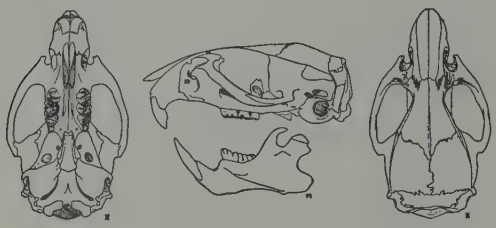


Fig. 375. *Sigmodon hispidus plenus*, Colorado River, ½ mi. above California–Nevada Monument, Nevada, No. 61836 M.V.Z., ♀, X 1.

Sigmodon hispidus alfredi Goldman and Gardner

1947. *Sigmodon hispidus alfredi* Goldman and Gardner, Jour. Mamm., 28:57, February 17, type from I. N. Pruitt Farm, near William's Corner, 11 mi. N Springfield, Baca Co., Colorado. Known only from the type locality.

Sigmodon hispidus arizonae Mearns

1890. *Sigmodon hispidus arizonae* Mearns, Bull. Amer. Mus. Nat. Hist., 2:287, February 21, type from Fort Verde, Yavapai Co., Arizona.

MARGINAL RECORDS.—Arizona: type locality; Sacaton (Hall and Davis, 1934:55); 11 mi. W Casa Grande, 1400 ft. (22861 KU); Laveen (Hall and Davis, 1934:55).

Sigmodon hispidus baileyi J. A. Allen

1903. *Sigmodon baileyi* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:601, November 12, type from La Ciénega de las Vacas, 8500 ft., Durango.
1912. *Sigmodon hispidus baileyi*, Miller, Bull. U. S. Nat. Mus., 79:183, December 31.

MARGINAL RECORDS (J. A. Allen, 1903:601).—Durango: Rancho Santuario; Arroyo de Bucy; type locality.

Sigmodon hispidus berlandieri Baird

1855. *Sigmodon berlandieri* Baird, Proc. Acad. Nat. Sci. Philadelphia, 7:333, type from Río Nazas, Coahuila.
1902. *Sigmodon hispidus berlandieri*, V. Bailey, Proc. Biol. Soc. Washington, 15:106, June 2.
1897. *Sigmodon hispidus pallidus* Mearns, Preliminary diagnoses of new mammals of the genera *Sciurus, Castor, Neotoma* and *Sigmodon*, from the Mexican border of the United States, p. 4, March 5 (preprint of Proc. U.S. Nat. Mus., 20:504, January 19, 1898), type from left bank of Rio Grande, about 6 mi. above El Paso, El Paso Co., Texas.

MARGINAL RECORDS (V. Bailey, 1902:106–107, unless otherwise noted).—Texas: 2¾ mi. W, 5 mi. S Old Mobeetie (Stickel and Stickel, 1948:292); Del Rio; about 2 mi. N Dilley (Blair, 1952:243); about 2 mi. W Oakville (*ibid.*); about 6 mi. E Rockport (*op. cit.*:244); Mustang Island (*op. cit.*:243). Tamaulipas: Soto la Marina (Hall, 1951: 42); Mesa de Llera (Hooper, 1953:9). Hidalgo: 97 km. N Mexico City (9 km. SW Pachuca), 8400 ft. (Davis, 1944: 399). Querétaro: Tequisquiapam. Jalisco: Lagos; Zapotlán [= C. Guzmán]; Ameca. Durango: Chacala [not in Jalisco as stated by Bailey]. Chihuahua: Chihuahua. New Mexico: near Deming (V. Bailey, 1932:66); Salinas (Blair, 1941: 226); Roswell (V. Bailey, 1932:66).

Sigmodon hispidus borucae J. A. Allen

1897. *Sigmodon borucae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:40, March 11, type from Boruca, near Río Diquís, 1600 ft., about 12 mi. from Pacific Coast, Puntarenas, Costa Rica.
1902. *Sigmodon hispidus borucae*, V. Bailey, Proc. Biol. Soc. Washington, 15:112, June 2.
1902. *Sigmodon austerulus* Bangs, Bull. Mus. Comp. Zool., 39:32, April, type from Volcán de Chiriquí, 10,000 ft., Chiriquí, Panamá. (Regarded as a synonym of *S. borucae* J. A. Allen, by Enders, Jour. Mamm., 34:509, November 13, 1953.)

MARGINAL RECORDS (Goodwin, 1946:406, unless otherwise noted).—Costa Rica: Hda. Santa María; San José (Elliot, 1907:248); Palmar; type locality; San Juanillo. (Panamá: Volcán de Chiriquí (Bangs, 1902:32)—The specimen from this locality is presumed to have come from near Boruca, Costa Rica, by Enders (1953:508).)

Sigmodon hispidus chiriquensis J. A. Allen

1904. *Sigmodon borucae chiriquensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:68, February 29, type from Boquerón, Chiriquí, Panamá.
1912. *Sigmodon hispidus chiriquensis*, Miller, Bull. U.S. Nat. Mus., 79:184, December 31.

MARGINAL RECORDS.—Costa Rica: Talamanca (Goodwin, 1946:407). Panamá (Goldman, 1920:106): Gatún; Bugaba.

Sigmodon hispidus cienegae A. B. Howell

1919. *Sigmodon hispidus cienegae* A. B. Howell, Proc. Biol. Soc. Washington, 32:161, September 30, type from Bullock's Ranch, 4 mi. E Fort Lowell, Pima Co., Arizona.

MARGINAL RECORDS.—Arizona: Fort Grant (Hall and Davis, 1934:54); Pinery Canyon (*ibid.*). Sonora: Granados (Hall and Kelson, 1952:369); Ures (Burt, 1938:60); Hermosillo (*ibid.*). Arizona: Continental, Santa Cruz River, 26 mi. S Tucson (Burt, 1933:120); type locality.

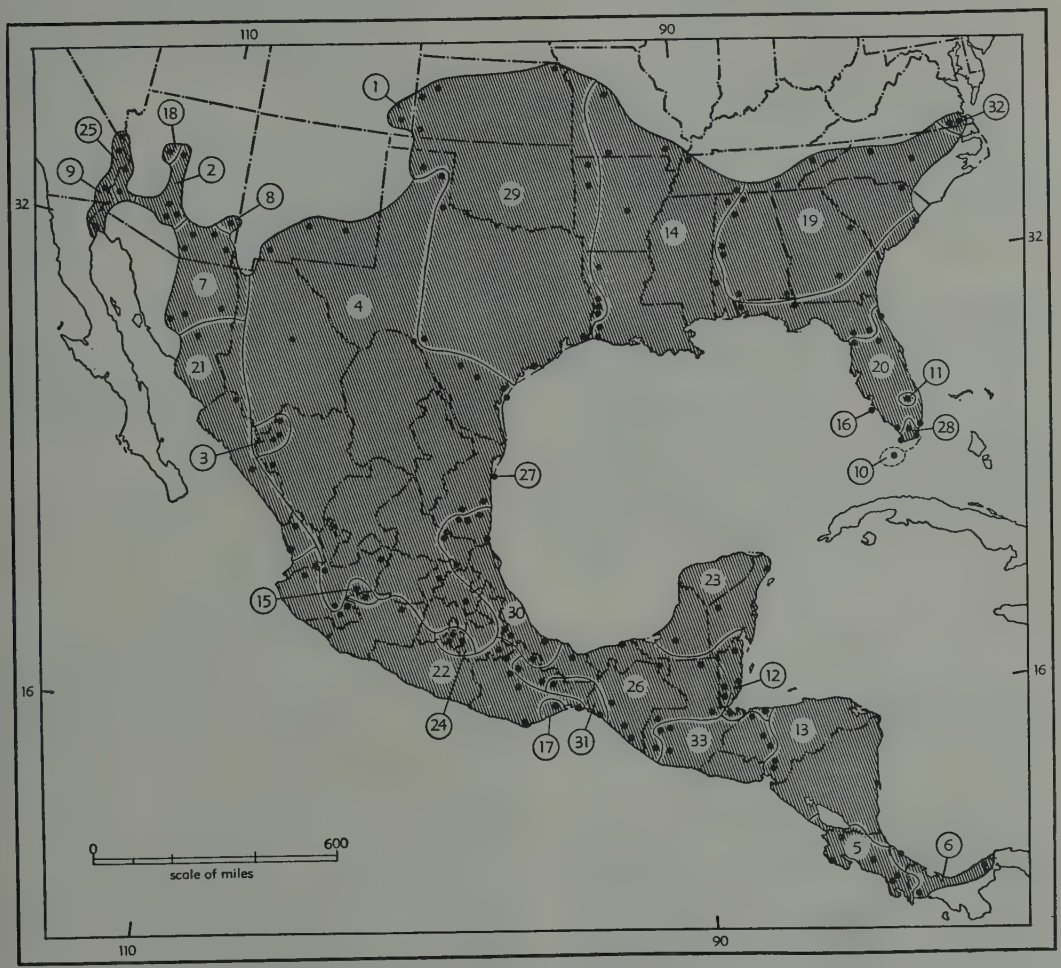
Sigmodon hispidus confinis Goldman

1918. *Sigmodon hispidus confinis* Goldman, Proc. Biol. Soc. Washington, 31:21, May 16, type from Safford, Graham Co., Arizona. Known only from the type locality.

Sigmodon hispidus eremicus Mearns

1897. *Sigmodon hispidus eremicus* Mearns, Preliminary diagnoses of new mammals of the genera *Sciurus, Castor, Neotoma* and *Sigmodon*, from the Mexican border of the United States, p. 4, March 5 (preprint of Proc. U.S. Nat. Mus., 20:504, January 19, 1898), type from Cienega Well, 30 mi. S Monument No. 204, Mexican boundary line, on east bank Colorado River, Sonora.

MARGINAL RECORDS.—California: a few mi. below Palo Verde (Grinnell, 1914:231), southward along both sides Colorado River to Sonora: opposite mouth Hardy River (Mearns, 1907:453).



Map 384. *Sigmodon hispidus.*

Guide to subspecies

1. *S. h. alfredi*
2. *S. h. arizonae*
3. *S. h. baileyi*
4. *S. h. berlandieri*
5. *S. h. borucae*
6. *S. h. chiriquensis*
7. *S. h. cienegae*
8. *S. h. confinis*
9. *S. h. eremicus*
10. *S. h. exsputus*
11. *S. h. floridanus*
12. *S. h. furvus*
13. *S. h. griseus*
14. *S. h. hispidus*
15. *S. h. inexoratus*
16. *S. h. insulicola*
17. *S. h. ischyrus*
18. *S. h. jacksoni*
19. *S. h. komareki*
20. *S. h. littoralis*
21. *S. h. major*
22. *S. h. mascotensis*
23. *S. h. microdon*
24. *S. h. obvelatus*
25. *S. h. plenus*
26. *S. h. saturatus*
27. *S. h. solus*
28. *S. h. spadicipygus*
29. *S. h. texianus*
30. *S. h. toltecus*
31. *S. h. tonalensis*
32. *S. h. virginianus*
33. *S. h. zanjonensis*

Sigmodon hispidus exsputus G. M. Allen

1920. *Sigmodon hispidus exsputus* G. M. Allen, Jour. Mamm., 1:236, December 4, type from Big Pine Key, one of the southern Florida Keys, Monroe Co., Florida.

MARGINAL RECORDS.—Florida (Schwartz, 1954:262): *Little Torch Key*; type locality.

Sigmodon hispidus floridanus A. H. Howell

1943. *Sigmodon hispidus floridanus* A. H. Howell, Proc. Biol. Soc. Washington, 56:73, June 16, type from Canal Point, Palm Beach Co., Florida. Known only from the type locality. The name *S. h. floridanus* was proposed in a posthumous publication; account seemingly was not taken of the previously named *S. h. littoralis*. There is need for reassignment of specimens to the two subspecies *littoralis* and *floridanus* and need for corresponding modification of the boundaries of the geographic ranges of the two subspecies, as shown on Map 384.

Sigmodon hispidus furvus Bangs

1903. *Sigmodon hispidus furvus* Bangs, Bull. Mus. Comp. Zool., 39(6):158, July, type from La Ceiba, Atlántida, Honduras.
1904. *Sigmodon hispidus fervidus* Lydekker, Zool. Record, 40(Mammals):34, an accidental renaming of *furvus*.

MARGINAL RECORDS.—British Honduras: Grant's Works (Laurie, 1953:393, on geographical grounds); thence along coast to Honduras: type locality. Guatemala: Puebla (Goodwin, 1934:52). British Honduras (Laurie, 1953:393, on geographical grounds): Silkgrass; *Stann Creek Valley*.

Sigmodon hispidus griseus J. A. Allen

1908. *Sigmodon hispidus griseus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:657, October 13, type from lowlands east of Lake Nicaragua, Chontales, Nicaragua.

MARGINAL RECORDS (Goodwin, 1942:168).—Honduras: Sabana Grande. Nicaragua: *type locality*. Honduras: El Zapote.

Sigmodon hispidus hispidus Say and Ord

1825. *S[igmodon]. hispidus* Say and Ord, Jour. Acad. Nat. Sci. Philadelphia, 4(2):354, type from St. Johns River, Florida.

MARGINAL RECORDS.—Missouri: Lamont (Elder, *in Litt.*); Wayne County (*ibid.*). Tennessee: 8¾ mi. NE Samburg (Goodpaster and Hoffmeister, 1952:369); 1 mi. E Pulaski (Kellogg, 1939:282). Alabama (A. H. Howell, 1921:52): Leighton; Jackson. Florida (Sherman, 1937: 119): Milton; Chattahoochee. Georgia: Riceboro (V. Bailey, 1902:104). South Carolina: Georgetown (V. Bailey, 1902: 104), thence southward along the coast to Florida: Welaka (Moore, 1946:57); Crystal River (Sherman, 1937:119), thence westward along the Gulf Coast to Louisiana: Cameron (Lowery, 1943:245); Lake Charles (Lowery, 1936:29); Minden (*ibid.*). Arkansas: Fourche River bottom near Little Rock (Dellinger and Black, 1940:190). Missouri: 5 mi. SE Branson (Elder, *in Litt.*).

Sigmodon hispidus inexoratus Elliot

1903. *Sigmodon hispidus inexoratus* Elliot, Field Columb. Mus., Publ. 71, Zool Ser., 3(8):144, March 20, type from Ocotlán, Jalisco.
1949. *Sigmodon hispiduas* [*sic*] *atratus* Hall, Proc. Biol. Soc. Washington, 62:149, August 23, type from 6½ mi. W Zamora, 5950 ft., Michoacán. (Regarded as inseparable from *S. h. inexoratus* by Russell, Proc. Biol. Soc. Washington, 65:82, April 25, 1952.)

MARGINAL RECORDS.—Jalisco: *4 mi. NE Ocotlán, 5050 ft.* (31799 KU); type locality. Michoacán: *Zamora* (Hall and Villa, 1949:466); 6½ mi. W Zamora, 5950 ft. (*ibid.*).

Sigmodon hispidus insulicola A. H. Howell

1943. *Sigmodon hispidus insulicola* A. H. Howell, Proc. Biol. Soc. Washington, 56:74, June 16, type from Captiva Island, Lee Co., Florida.

MARGINAL RECORDS.—Florida (A. H. Howell, 1943: 75): *Englewood; Pine Island; Sanibel Island*; type locality.

Sigmodon hispidus ischyrus Goodwin

1956. *Sigmodon hispidus ischyrus* Goodwin, Amer. Mus. Novit., 1791:8, September 28, type from "El Arco" Gorge of Río Grande, Santo Domingo Chontecomatlán, District of Yautepec, 2600 ft., Oaxaca. Known only from the type locality.

Sigmodon hispidus jacksoni Goldman

1918. *Sigmodon hispidus jacksoni* Goldman, Proc. Biol. Soc. Washington, 31:22, May 16, type from 3 mi. N Fort Whipple, 5000 ft., near Prescott, Yavapai Co., Arizona. Known only from the type locality.

Sigmodon hispidus komareki Gardner

1948. *Sigmodon hispidus komareki* Gardner, Proc. Biol. Soc. Washington, 61:97, June 16, type from Woodville, 616 ft., Jackson Co., Alabama.

MARGINAL RECORDS (Gardner, 1948:98).—North Carolina: Elkin; Raleigh. South Carolina: Society Hill. Georgia: Augusta; Nashville. Alabama: Ashford; Castleberry; Gallion; Greensboro; Ardell; Huntsville. Tennessee: Rathburn; 1 mi. W Bearden (*S. h. komareki* on geographical grounds from J. Howell, 1954:177).

Sigmodon hispidus littoralis Chapman

1889. *Sigmodon hispidus littoralis* Chapman, Bull. Amer. Mus. Nat. Hist., 2:118, June 7, type from East Peninsula, opposite Micco, Brevard Co., Florida.

MARGINAL RECORDS.—Florida (Sherman, 1937:119, unless otherwise noted): Anastasia Island (Pournelle and Barrington, 1953:135); Miami; Everglade; Citronella (Elliot, 1907:245); Enterprise; *4 mi. SW St. Augustine* (27089 KU). See comments on geographic range in the account (*ante*) of *S. h. floridanus*.

Sigmodon hispidus major V. Bailey

1902. *Sigmodon hispidus major* V. Bailey, Proc. Biol. Soc. Washington, 15:109, June 2, type from Sierra de Choix, 50 mi. [probably 10 or 15 mi.] NE Choix, Sinaloa.

MARGINAL RECORDS.—Sonora: Tecoripa (Burt, 1938: 62). Sinaloa: type locality; Culiacán (V. Bailey, 1902:110). Nayarit: Tepic (*ibid.*); 3¾ mi. E San Blas (Hooper, 1955: 20); *San Blas* (V. Bailey, 1902:110).

Sigmodon hispidus mascotensis J. A. Allen

1897. *Sigmodon mascotensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:54, March 15, type from Mineral San Sebastián, Mascota, Jalisco.
1902. *Sigmodon hispidus mascotensis*, V. Bailey, Proc. Biol. Soc. Washington, 15:108, June 2.
1897. *Sigmodon colimae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:55, March 15, type from plains of Colima, Colima.

MARGINAL RECORDS.—Nayarit: Rancho Palo Amarillo, near Amatlán de Cañas (J. A. Allen, 1906:247). Jalisco: Tuxpan (Hall and Villa, 1949:466); ½ mi. NW Mazamitla (Hooper, 1955:21). Michoacán: Queréndaro (Russell, 1952:82). Puebla: Tehuacán, 1700 m. (Hooper, 1947:54). Oaxaca: Teotitlán (*ibid.*); Cuicatlán (V. Bailey, 1902:109); Oaxaca (*ibid.*); Reforma (Elliot, 1907:246); Puerto Angel (V. Bailey, 1902:109), thence northward along coast to Jalisco: type locality.

Sigmodon hispidus microdon V. Bailey

1902. *Sigmodon hispidus microdon* V. Bailey, Proc. Biol. Soc. Washington, 15:111, June 2, type from Puerto Morelos, Quintana Roo.

MARGINAL RECORDS.—Quintana Roo: type locality; Esmeralda (Hatt and Villa, 1950:237). Campeche: Apazote (V. Bailey, 1902:112), thence around coast to point of beginning.

Sigmodon hispidus obvelatus Russell

1952. *Sigmodon hispidus obvelatus* Russell, Proc. Biol. Soc. Washington, 65:81, April 25, type from 5 mi. S Alpuyeca, 3700 ft., Morelos.

MARGINAL RECORDS.—Morelos (Davis and Russell, 1954:76): Cuernavaca; *Yautepec*; 2 km. S Jonacatepec; type locality.

Sigmodon hispidus plenus Goldman

1928. *Sigmodon hispidus plenus* Goldman, Proc. Biol. Soc. Washington, 41:205, December 18, type from Parker, 350 ft., Yuma Co., Arizona.

MARGINAL RECORDS.—Nevada: Colorado River, ½ mi. N California–Nevada Monument, 500 ft. (Hall, 1946:527). California: Needles (Goldman, 1928:205–206). Arizona (*ibid.*): Parker; 15 mi. SW Ehrenberg.

Sigmodon hispidus saturatus V. Bailey

1902. *Sigmodon hispidus saturatus* V. Bailey, Proc. Biol. Soc. Washington, 15:111, June 2, type from Teapa, Tabasco.

MARGINAL RECORDS (V. Bailey, 1902:111, unless otherwise noted).—Tabasco: Frontrera; Monte Cristo. Guatemala: Uaxactun (A. Murie, 1935:27). British Honduras (A. Murie, 1935:27): El Cayo; Mountain Pine Ridge. Guatemala: Chimoxan (Goodwin, 1934:52); Hda. Chancol; Zunil. Chiapas: Huehuetán; Prusia (Villa, 1949:520); Ocuilapa. Oaxaca: mountains near Santo Domingo; Cuicatlán. Veracruz: Coatzacoalcos.

Sigmodon hispidus solus Hall

1951. *Sigmodon hispidus solus* Hall, Univ. Kansas Publ., Mus. Nat. Hist., 5:42, October 1, type from island 88 mi. S, 10 mi. W Matamoros, Tamaulipas. Known only from the type locality.

Sigmodon hispidus spadicipygus Bangs

1898. *Sigmodon hispidus spadicipygus* Bangs, Proc. Boston Soc. Nat. Hist., 28:192, March, type from Cape Sable, Monroe Co., Florida.

MARGINAL RECORDS.—Florida: 10 mi. E Pine Crest (Sherman, 1937:119); Planter (*ibid.*); Northwest Cape (Blair, 1935:804).

Sigmodon hispidus texianus (Audubon and Bachman)

1853. *Arvicola texiana* Audubon and Bachman. The viviparous quadrupeds of North America, 3:229, type from Brazos River, Texas.
1891. *Sigmodon hispidus texianus*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:287, June 30.

MARGINAL RECORDS.—Kansas: 5 mi. S Hiawatha (Cockrum, 1952:186). Arkansas (Black, 1936:33): Huntsville; Ozark. Louisiana (Lowery, 1943:246): Vowell's Mill; Kisatchie; Leesville. Texas: La Belle (Blair, 1941:379); Matagorda (V. Bailey, 1902:105); Fort Clark (Mearns, 1907:449); Paducah (Blair, 1954:252); Stinnett (*ibid.*). Kansas (Cockrum, 1952:187): Morton County; Greeley County; Logan County.

Sigmodon hispidus toltecus (Saussure)

1860. [*Hesperomys*] *toltecus* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:98, type from mountains of Veracruz [probably near Mirador, Dalquest, Louisiana State Univ. Studies, Biol. Sci. Series, 1:163, December 28, 1953].
1902. *Sigmodon hispidus toltecus*, V. Bailey, Proc. Biol. Soc. Washington, 15:110, June 2.

MARGINAL RECORDS.—Tamaulipas: Sierra de Tamaulipas (Hooper, 1953:9); Altamira (V. Bailey, 1902:110), thence southward along the coast to Veracruz: Catemaco (V. Bailey, 1902:109); specimens examined by us and here referred to *toltecus*). Oaxaca: 5 km. W Tuxtepec (28255 KU). Veracruz: Orizaba (V. Bailey, 1902:110); Mt. Orizaba (Elliot, 1907:247). San Luis Potosí (Dalquest, 1953b:164): Xilitla at Apetesco; 10 mi. E, 2 mi. N Ciudad del Maíz; El Salto. Tamaulipas: Rancho del Cielo (Hooper, 1953:9); Pano Ayuctle (Goodwin, 1954:13).

Sigmodon hispidus tonalensis V. Bailey

1902. *Sigmodon hispidus tonalensis* V. Bailey, Proc. Biol. Soc. Washington, 15:109, June 2, type from Tonalá, Chiapas.

MARGINAL RECORDS.—Oaxaca: Santo Domingo (V. Bailey, 1902:109). Chiapas: type locality.

Sigmodon hispidus virginianus Gardner

1946. *Sigmodon hispidus virginianus* Gardner, Proc. Biol. Soc. Washington, 59:137, October 25, type from Triplet, 160 ft., Brunswick Co., Virginia.

MARGINAL RECORDS.—Virginia (Gardner, 1946:137); Clarksville; type locality.

Sigmodon hispidus zanjonensis Goodwin

1932. *Sigmodon zanjonensis* Goodwin, Amer. Mus. Novit., 528:1, May 23, type from Zanjón, 9000 ft., Quezaltenango, Guatemala.
1934. *Sigmodon hispidus zanjonensis* Goodwin, Bull. Amer. Mus. Nat. Hist., 68:53, December 12.

MARGINAL RECORDS.—Honduras (Goodwin, 1942: 168): Catacombas; Monte Redondo; Comayaguela. Guatemala (Goodwin, 1934:53): San Lucas; Huehuetenango; Sacapulas.

fulviventer-group

Sigmodon fulviventer J. A. Allen
Zacatecan Cotton Rat

1889. *Sigmodon fulviventer* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 2:180, October 21, type from Zacatecas, Zacatecas.

External measurements of the type are: 270; 108; 33. "Upper parts yellowish brown, lightened on sides by white bristles; upper half of outer surface of ear black; lower parts and feet clear rich fulvous; tail brownish black above and below.

"Skull.—Short, wide, and heavily ridged, not much arched, not bulged interorbitally; interparietal, about 2 mm. wide and not divided; supraoccipital with a slight median ridge; nasals short, wide and rounded at ends; jaw short and heavy with short, wide coronoid" (V. Bailey, 1902:113).

MARGINAL RECORDS.—Durango: Durango (Miller, 1924:373). Zacatecas: type locality. See Map 386.

Sigmodon alleni V. Bailey
Allen's Cotton Rat

1902. *Sigmodon alleni* V. Bailey, Proc. Biol. Soc. Washington, 15:112, June 2, type from San Sebastián, Mascota, Jalisco.

Average external measurements of 8 topotypes are: 244; 108; 33. "Upper parts dull tawny; belly white or buffy; feet yellowish brown; tail black above and brownish below. . . . Skull.—Similar to that of *berlandieri* but with narrower braincase, double convex outlines of interparietal, smaller molars, and smaller, shorter, more rounded bullae" (V. Bailey, 1902:113).

MARGINAL RECORDS (V. Bailey, 1902:113).—Nayarit: San Blas; Tepic. Jalisco: type locality. See Map 386.

Sigmodon macdougalli Goodwin
MacDougall's Cotton Rat

1955. *Sigmodon macdougalli* Goodwin, Amer. Mus. Novit., 1705:3, February 4, type from Santo Tomás Teipán (rain forest above village), 7000 ft., 12 km. S Yautepec, Oaxaca. Known from the type locality and [other] "mountains of southwestern Tehuantepec." See Map 386.

External measurements of the type, an adult female, are: 262; 125; 33. Condylobasal length of skull, 30; zygomatic breadth, 17.8; alveolar length of maxillary tooth-row, 6.2. Upper parts Warm Buff finely mixed with black, darkest on head and shoulders; tinge of Ochraceous Tawny on rump; tip of nose black; ears Mummy Brown; hair of underparts basally plumbeous, white distally; all four feet white; tail sharply bicolor, white below and Mummy Brown above (after Goodwin, 1955a:3).

Sigmodon vulcani J. A. Allen
Volcano Cotton Rat

1906. *Sigmodon vulcani* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 22:247, July 25, type from Volcán de Fuego, 10,000 ft., Jalisco. Known only from type locality. See Map 386.

External measurements of the type are: 238; 112; 31.6. Upper parts yellowish brown; underparts gray; sides of nose pale buff; tail blackish above, slightly grayish below. Skull short, broad; braincase especially broad; interorbital region shortened.

Sigmodon guerrerensis Nelson and Goldman
Guerreran Cotton Rat

1933. *Sigmodon guerrerensis* Nelson and Goldman, Proc. Biol. Soc. Washington, 46:196, October 26, type from Omilteme, 8000 ft., Guerrero. Known only from the type locality. See Map 386.

External measurements of the type, an adult female, are: 278; 128; 32. "Upper parts light tawny, richest on rump, but purest on cheeks, shoulders and flanks, the top of head and back mixed or lined with black; underparts overlaid with cinnamon buff, becoming abruptly tawny on a narrow area across base of tail; ears blackish; . . . tail dark brown above, lighter brown below. . . . Skull.—About like that of *S. vulcani*. Very similar to that of *S. alleni*, but larger, more angular, with relatively heavier molars; supraorbital and temporal ridges more strongly developed; interparietal large, the anterior border convex or nearly straight and upper incisors heavy and recurved as in *alleni*. Contrasting strongly with *S. alticola* as follows: Braincase relatively more elongated; rostrum and nasals decidedly broader; interparietal much longer (antero-

posteriorly) with a prominent posterior angle; supraoccipital region rising nearly perpendicularly (not sloping forward at expense of interparietal as in *alticola*); dentition heavier" (Nelson and Goldman, 1933:197).

Sigmodon melanotis V. Bailey
Black-eared Cotton Rat

1902. *Sigmodon melanotis* V. Bailey, Proc. Biol. Soc. Washington, 15:114, June 2, type from Pátzcuaro, 7000 ft., Michoacán. See Map 386.

External measurements of the type, an adult female, are: 275; 100; 31. "Upper parts dark, rich ochraceous, heavily lined with black; outer and part of inner surface of ears black; face and nose blackish; belly clear, dark, rusty ochraceous; feet yellowish brown; tail mainly black, yellowish below at base.

"Skull.—High and heavily ridged in adults with zygomatic arches falling low at sides; interorbital space narrow and bulged on top; nasals rounded at ends; interparietal about 2 mm. wide and not divided; supraoccipital with distinct median ridge" (V. Bailey, 1902:114).

MARGINAL RECORDS.—Jalisco: ½ mi. NW Mazamitla (Hooper, 1955:21). Michoacán: *2 mi. W Pátzcuaro* (Hall and Villa, 1949:465); type locality; *3½ mi. S Pátzcuaro, 7800 ft.* (Hall and Villa, 1949:465); Tancítaro (*ibid.*). Jalisco: *1½ mi. W Mazamitla* (Hooper, 1955:21).

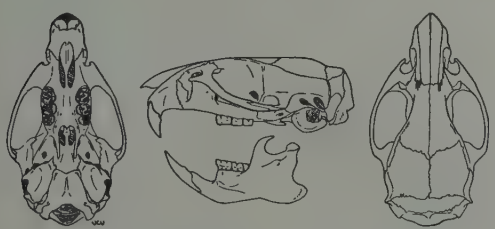


Fig. 376. *Sigmodon melanotis*, 2 mi. W Pátzcuaro, 7700 ft., Michoacán, No. 100623 M.V.Z., ♀, X 1.

Sigmodon minimus
Least Cotton Rat

External measurements: 223–257; 94–107; 28–31. Upper parts varying according to subspecies from clear, coarsely grizzled gray to grizzled golden gray; underparts varying from buffy to rich fulvous; tail usually brownish, faintly bicolored; feet variable. Skull short and wide; zygomata widely spreading; interparietal narrow.

Sigmodon minimus goldmani V. Bailey

1913. *Sigmodon minimus goldmani* V. Bailey, Proc. Biol. Soc. Washington, 26:132, May 21, type from 7 mi. N Las Palomas (at Hot Springs), 4200 ft., Sierra Co., New Mexico. Known only from the type locality. See Map 386.

Sigmodon minimus minimus Mearns

1894. *Sigmodon minima* Mearns, Proc. U.S. Nat. Mus., 17:130, July 19, type from near Monument No. 40, 1500 m., Hidalgo Co., New Mexico, on the Mexican boundary line, 100 miles west of the initial monument on west bank of Rio Grande.

MARGINAL RECORDS (V. Bailey, 1902:114, unless otherwise noted).—New Mexico: near Alamagordo (Dice, 1930:26). Chihuahua: Casas Grandes. Durango (J. A. Allen, 1903:600–601): Rosario; Rancho Bailon. Sonora: Río Santa Cruz (Burt, 1938:62). Arizona: Fort Huachuca. New Mexico: Silver City (V. Bailey, 1932:169). See Map 386.

Sigmodon minimus woodi Gardner

1948. *Sigmodon minimus woodi* Gardner, Jour. Mamm., 29:65, February 13, type from east side Rio Grande, 51 mi. S Albuquerque, near Bernardo, 5000 ft., Socorro Co., New Mexico.

MARGINAL RECORDS (Gardner, 1948:65).—New Mexico: type locality; *Bernardo* (*opposite, on E bank of Rio Grande*). See Map 386.

Sigmodon ochrognathus
Yellow-nosed Cotton Rat

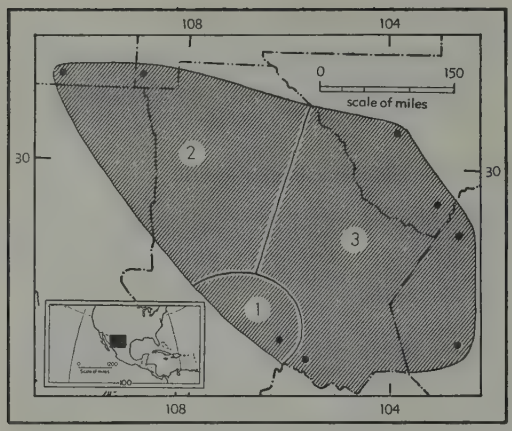
External measurements: 233–260; 100–117; 28–29. Upper parts grizzled yellowish gray becoming more ochraceous on rump and flanks; underparts whitish; tail indistinctly or sharply bicolored, blackish above yellowish gray below. Skull "similar to that of *minimus* but interparietal with a posterior indentation, bullae narrower and basioccipital shorter and wider; nasals short, wide, and truncate posteriorly" (V. Bailey, 1902:115).

Sigmodon ochrognathus madrensis Goldman and Gardner

1947. *Sigmodon ochrognathus madrensis* Goldman and Gardner, Jour. Mamm., 28:58, February 17, type from foothills of Sierra Madre, about 30 mi. NW Parral, 6200 ft., Chihuahua. Known only from the type locality.

Sigmodon ochrognathus montanus Benson

1940. *Sigmodon ochrognathus montanus* Benson, Proc. Biol. Soc. Washington, 53:157, December 19, type from Peterson's Ranch ("Sylvania"), 6100 ft., 2 mi. N Sunnyside, Huachuca Mts., Cochise Co., Arizona.



Map 385. *Sigmodon ochrognathus.*

Guide to subspecies
1. *S. o. madrensis*
2. *S. o. montanus*
3. *S. o. ochrognathus*

MARGINAL RECORDS (Benson, 1940:157).—Arizona: type locality; *head Miller Canyon, 8400 ft.* New Mexico: Animas Valley, 4 mi. NW San Luis Pass, 5200 ft.

Sigmodon ochrognathus ochrognathus V. Bailey

1902. *Sigmodon ochrognathus* V. Bailey, Proc. Biol. Soc. Washington, 15:115, June 2, type from Chisos Mts., 8000 ft., Brewster Co., Texas.

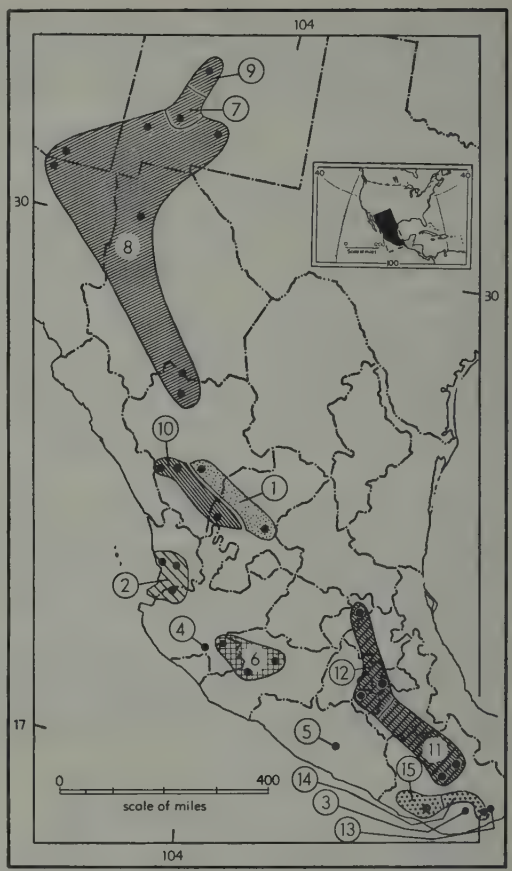
MARGINAL RECORDS.—Texas: Davis Mts. (Taylor and Davis, 1947:60); type locality. Coahuila (Baker, 1956:279): Tinaja de Telles, 4800 ft., El Jardín Ranch, Sierra de Carmen; 20 mi. S, 4 mi. W Ocampo, 5300 ft. Chihuahua: Parral (Benson, 1940:158).

Sigmodon leucotis V. Bailey
White-eared Cotton Rat

1902. *Sigmodon leucotis* V. Bailey, Proc. Biol. Soc. Washington, 15:115, June 2, type from Sierra de Valparaíso, 8700 ft., Zacatecas.

Average external measurements of 8 adult topotypes are: 234; 91; 29.4. Upper parts dull brownish gray; ears whitish gray; belly whitish; feet brownish gray; tail black, becoming brownish at base below. Skull short and wide; heavily ridged along sides; interparietal narrow anteroposteriorly, this dimension less than 27 per cent of upper molariform toothrow; supraoccipital sloping, without trace of median ridge; nasals short, narrow and notched at posterior end; audital bullae full and oval (after V. Bailey, 1902:115 and Hooper, 1955:21).

MARGINAL RECORDS.—Durango: ¾ mi. E San Luis (Hooper, 1955:21); Coyotes (Elliot, 1907:248). Zacatecas: type locality.



Map 386. Several species of *Sigmodon.*

Guide to kinds
1. *S. fulviventer*
2. *S. alleni*
3. *S. macdougalli*
4. *S. vulcani*
5. *S. guerrerensis*
6. *S. melanotis*
7. *S. minimus goldmani*
8. *S. minimus minimus*
9. *S. minimus woodi*
10. *S. leucotis*
11. *S. alticola alticola*
12. *S. alticola amoles*
13. *S. macrodon*
14. *S. planifrons minor*
15. *S. planifrons planifrons*

Sigmodon alticola
Mountain Cotton Rat

External measurements of the types of *S. a. alticola* and of *S. a. amoles* are, respectively: 230, 252; 101, 105; 28.5, 29.5. Upper parts light grizzled brown; underparts approximately tawny; ears gray (slightly darker than in *S. leucotis*); tail black, yellowish brown basally. Skull resembling "that of *leucotis* in form but slenderer, less heavily ridged

and narrower interorbitally; interparietal narrow with a dividing suture in middle [not in *amoles*]; supraoccipital without median ridge; nasals narrow and rounded at ends; lateral pits of palate very shallow" (V. Bailey, 1902:116).

Sigmodon alticola alticola V. Bailey

1902. *Sigmodon alticola* V. Bailey, Proc. Biol. Soc. Washington, 15:116, June 2, type from Cerro San Felipe, 10,000 ft., Oaxaca.

MARGINAL RECORDS.—Oaxaca: type locality; 15 mi. W Oaxaca (V. Bailey, 1902:116).

Sigmodon alticola amoles V. Bailey

1902. *Sigmodon alticola amoles* V. Bailey, Proc. Biol. Soc. Washington, 15:116, June 2, type from Pinal de Amoles, 7000 ft., Querétaro.

MARGINAL RECORDS.—Querétaro: type locality. México: Monte Río Frío, 45 km. ESE Mexico City, 10,500 ft. (Davis, 1944:399). Morelos: 2 mi. W Huitzilac (Davis and Russell, 1954:76).

Sigmodon macrodon Goodwin
Tehuantepec Cotton Rat

1955. *Sigmodon macrodon* Goodwin, Amer. Mus. Novit., 1705:4, February 4, type from Cerro San Pedro (rocky summit) 3600 ft., 20 km. W Mixtequilla, Oaxaca. Known only from the type locality.

External measurements of the type, an adult female, are: 250; 120; 32. Condylobasal length of skull, 28.7; zygomatic breadth, 17.9; alveolar length of maxillary tooth-row, 5.9. Upper parts dull Cinnamon Buff mixed with Cinnamon-Brown hairs, slightly darker on head and shoulders, becoming paler towards rump; tip of nose Ochraceous-Buff; ears Tawny-Olive; hair of underparts basally plumbeous and distally white but white to base on throat; forefeet Cinnamon-Buff; hind feet white; tail indistinctly bicolor, Cinnamon-Brown above and Cinnamon-Buff below (after Goodwin, 1955a:4).

Sigmodon planifrons
Oaxacan Cotton Rat

External measurements of the two types, adult females, of *S. p. minor* and *S. p. planifrons*, are, respectively: 220, 207; 111, 88; 29, 29. Upper parts approximately ochraceous tawny mixed with black; underparts white; ears same color as back; tail dark brown above, light brown below. Skull small; braincase flattened; skull resembling that of *alticola*, but smaller; zygomatic plate broader anteroposteriorly, as viewed from side; auditory bullae much smaller; rostrum slender and upper incisors slightly recurved as in *alticola*; resembling skull of *alleni*, but smaller, more nearly flat, less angular, and basicranial region more smoothly rounded; rostrum slenderer, shallower, more depressed anteriorly; auditory bullae small as in *alleni*; upper incisors lighter, less recurved (after Nelson and Goldman, 1933:198).

Sigmodon planifrons minor Goodwin

1955. *Sigmodon planifrons minor* Goodwin, Amer. Mus. Novit., 1705:1, February 4, type from Santa Lucía, 4000 ft., 12 km. NE Tenango, Oaxaca. Known only from the type locality.

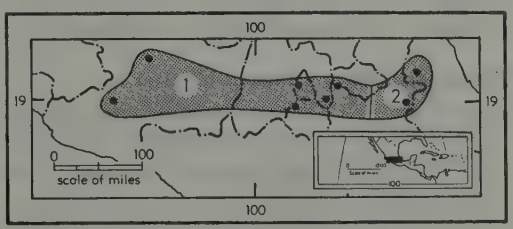
Sigmodon planifrons planifrons Nelson and Goldman

1933. *Sigmodon planifrons* Nelson and Goldman, Proc. Biol. Soc. Washington, 46:197, October 26, type from Juquila, 5000 ft., Oaxaca. Known only from the type locality.

Genus **Neotomodon** Merriam—Volcano Mouse

1898. *Neotomodon* Merriam, Proc. Biol. Soc. Washington, 12:127, April 30. Type, *Neotomodon alstoni* Merriam.

External measurements: 176–233; 78–105; 23–27; 19–23. Ears large and nearly naked; fur soft, dense; plantar tubercles 6; mammae 6. Skull broad; braincase strongly vaulted, short; zygomata widely spreading; zygomatic plate extended anteriorly; incisive foramina long, wide. Molars rooted, massive (almost disproportionately large); flat-crowned, heavily enameled. M1 and M2 similar, each having 3 external loops and 2 deep external re-entrant angles, and 2 internal loops and 1 shallow internal re-entrant angle; M3 peglike. Enamel pattern changes markedly with wear. With wear on M1 only the last inner and outer re-entrant angles persist. In M2 only external posterior angle persists.



Map 387. *Neotomodon alstoni*.

1. *N. a. alstoni* 2. *N. a. perotensis*

"*Neotomodon* is much like *Peromyscus melanotis* in habits, living in close association with it and inhabiting grass-covered slopes on the high mountains of central Mexico. It appears to be strictly nocturnal and most active shortly after dark. Its bur-

rows are of simple design, short and shallow. The breeding season extends at least from early June to September. Two or more litters, averaging 3.4 young each, are born each year and young-of-the-year may mature sexually and bear young the same season they themselves are born." (Davis and Follansbee, 1946:411.) Only one species is known.

Neotomodon alstoni
Volcano Mouse

For measurements and cranial details see account of the genus. Upper parts grayish to grayish buff, sometimes (seasonally) becoming fulvous brown; underparts white (underlying plumbeous showing conspicuously), often faintly washed with buff pectorally; tail sharply bicolored, dusky above, white below.

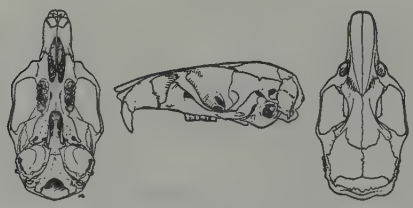


Fig. 377. *Neotomodon alstoni alstoni*, 5 mi. E Amecameca, 9600 ft., México, No. 91969 M.V.Z., ♂, X 1.

Neotomodon alstoni alstoni Merriam

1898. *Neotomodon alstoni* Merriam, Proc. Biol. Soc. Washington, 12:128, April 30, type from Nahuatzin, 8500 ft., Michoacán.

MARGINAL RECORDS.—Michoacán: type locality. Distrito Federal: 2.5 km. SW Contreras, 2850 m. (Villa, 1953: 438). Puebla: Río Otlati, 15 km. NW San Martín, 8700 ft. [Texmeluacán] (Davis, 1944:398). México: Mt. Popocatépetl (Merriam, 1898:128). Morelos: Huitzilac (*ibid.*). Michoacán: Mt. Tancítaro (Hall and Villa, 1949:466).

Neotomodon alstoni perotensis Merriam

1898. *Neotomodon perotensis* Merriam, Proc. Biol. Soc. Washington, 12:129, April 30, type from Cofre de Perote, 9500 ft., Veracruz.
1944. *Neotomodon alstoni perotensis*, Davis, Jour. Mamm., 25:398, December 12.
1898. *Neotomodon orizabae* Merriam, Proc. Biol. Soc. Washington, 12:129, April 30, type from Volcán de Orizaba, 9500 ft., Puebla.

MARGINAL RECORDS.—Veracruz: type locality. Puebla: W slope Mt. Orizaba, 11,000 ft. (Davis, 1944:398).

Genus Neotoma Say and Ord—Wood Rats

Revised by Goldman, N. Amer. Fauna, 31:1–124, 8 pls., 14 figs., October 19, 1910; partly rearranged by Goldman, Jour. Mamm., 13:59–67, February 10, 1932.

1825. *Neotoma* Say and Ord, Jour. Acad. Nat. Sci. Philadelphia, 4(2):345. Type, *Mus floridanus* Ord.

External measurements: 225–470; 76–241; 28–52. Form ratlike; tail relatively long, usually clothed with short hairs, but in some species distichous and in others nearly naked. Upper parts varying from pale buff or gray to rich buff or ferruginous, more or less mixed with black; underparts usually white but sometimes pale buff. Skull narrow interorbitally; supraorbital ridges present but not markedly developed; rostrum relatively slender; incisive foramina long, extending to level of M1; bullae relatively large (but variable), obliquely situated, tapered anteriorly. Molars flat-crowned, prismatic, hypsodont, somewhat resembling those of microtines but simpler; M1 with two outer and two inner folds, the anterointernal fold not excessively deep; M2 with two outer folds and one inner fold, inner fold deep in subgenus *Hodomys*; M3 essentially as in M2; m1 and m2 with two outer folds, m3 with one; m1 with three inner folds (usually), m2 with two, m3 with one; enamel pattern of m3 distinctly S-shaped in subgenus *Hodomys*.

Wood rats (or pack rats, as they are sometimes called) are widely distributed in North America. Each species usually is restricted to a given type of habitat, but wood rats, as a genus, occur from low, hot, dry deserts or humid jungles to rocky slopes above timberline. Usually rocky places are preferred. Nests are made in crevices, ledges, under rocks, on level ground at the base of a tree or clump of cacti, or even among the low branches of trees. The "house" usually consists of a pile of sticks, leaves, cacti, and all sorts of available debris. Many desert-dwelling species show a decided predilection for collecting spiny parts of cacti. The vernacular name "pack rat" refers to the animal's habit of collecting all sorts of objects and bringing them to the den site. Wood rats seldom enter urban areas, but often build nests in outbuildings in rural areas or abandoned structures in the wild.

Most wood rats climb readily but, as a group, are not especially arboreal in habit. They are chiefly nocturnal, but not exclusively so. The diet consists chiefly of plant materials, but is not especially restricted otherwise. Briefly, they eat what is available.

The molting cycle varies with latitude, but there is normally but one molt annually and this occurs, in the northern parts of the range, in late summer or early autumn. By spring the pelage is much worn and faded.

Currently four subgenera, *Neotoma*, *Teonoma*, *Hodomys*, and *Teanopus*, are recognized. There is much variation, both at the specific and individual

levels, however, and certain individual specimens may be correctly placed systematically only with difficulty, even as to subgenus.

KEY TO SUBGENERA OF NEOTOMA

1. Audital bullae greatly enlarged (almost semicircular in profile but not greatly widened transversely), little tapered anteriorly, and situated only slightly obliquely to the long axis of the skull. . . . *Teanopus*, p. 706
1′. Audital bullae not greatly enlarged; bullae tapered anteriorly, and situated obliquely.
   2. Enamel pattern of chewing-surface of m3 distinctly S-shaped. . . *Hodomys*, p. 705
   2′. Enamel pattern of chewing-surface of m3 not S-shaped.
      3. Tail markedly distichous; basal part of baculum quadrate in cross-section with slight concavity on dorsal and ventral surfaces. . . . *Teonoma*, p. 701
      3′. Tail terete or almost naked; baculum not quadrate in basal cross-section and lacking concavity on dorsal and ventral surfaces. . . . *Neotoma*, p. 681

Subgenus Neotoma Say and Ord

1825. *Neotoma* Say and Ord, Jour. Acad. Nat. Sci. Philadelphia, 4(2):345. Type, *Mus floridanus* Ord.

1910. *Homodontomys* Goldman, N. Amer. Fauna, 31:86, October 19. Type, *Neotoma fuscipes* Baird. (Arranged as a synonym by Burt and Barkalow, Jour. Mamm., 23: 296, August 14, 1942.)

First upper molar with anterointernal angle of variable depth or obsolete; M3 with middle loop either divided or undivided by re-entrant angles; auditory bullae of variable size; "tail terete, tapering, and short-haired; hind foot naked below along outer side at least to tarsometatarsal joint" (Goldman, 1910:20). Length of baculum more than 5 mm; lateral diameter of the base more than 1.7.

Within this subgenus, six species-groups are recognized; these are *floridana, albigula, lepida, mexicana, micropus,* and *fuscipes.*

The following nominal species are known only from the islands in the Gulf of California and off the Pacific Coast of Baja California.

Neotoma varia . . . . . Turners Island, Sonora
Neotoma bryanti . . . . . Cedros Island, Baja California
Neotoma anthonyi . . . . . Todos Santos Island, Baja California
Neotoma martinensis . . . . . San Martín Island, Baja California
Neotoma bunkeri . . . . . Coronados Island, Baja California

These species are not considered in the following key.

KEY TO NOMINAL SPECIES OF SUBGENUS NEOTOMA

1. Occurring north of México.
   2. Occurring in California or Oregon.
      3. Tail markedly bicolored.
         4. Hairs on throat white to base. . . . . *N. albigula*, p. 686
         4′. Hairs on throat plumbeous basally. . . . . *N. lepida*, p. 689
      3′. Tail not markedly bicolored. . . . . *N. fuscipes*, p. 699
   2′. Occurring other than in California or Oregon.
      5. Anterointernal re-entrant angle of M1 extending more than half way across crown.
         6. Lateral diameter of base of baculum more than 2.80; total length of rat more than 375; occurring east of Mississippi River. . . . . *N. floridana* (subspecies *magister*), p. 682
         6′. Lateral diameter of base of baculum less than 2.80; total length of rat less than 375; occurring west of Mississippi River. . . . . *N. mexicana*, p. 695
      5′. Anterointernal re-entrant angle of M1 not extending more than half way across crown.
         7. Occurring west of a line drawn through central Colorado and central New Mexico.
            8. Hairs on throat white to base.
               9. Upper parts steely gray. . . . . *N. micropus*, p. 685
               9′. Upper parts buffy or grayish more or less strongly washed with fulvous. *N. albigula*, p. 686
            8′. Hairs on throat plumbeous basally.
               10. Upper parts usually pinkish buff; tail sharply bicolored; hairs on tail short. *N. lepida*, p. 689
               10′. Upper parts ochraceous or yellowish; tail only faintly or not at all bicolored; hairs on tail moderately long. . . . . *N. stephensi*, p. 694
         7′. Occurring east of a line drawn through central Colorado and central New Mexico.
            11. Upper parts steely gray (except in an occasional specimen from southern Texas). *N. micropus*, p. 685
            11′. Upper parts not steely gray.

12. Tail sharply bicolored; baculum curved in profile and with rounded base. . . . . *N. albigula*, p. 686
12′. Tail not sharply bicolored; baculum straight in profile and with truncated base. . *N. floridana*, p. 682
1′. Occurring south of United States.
13. Occurring in western Sonora or Baja California.
14. Tail sharply bicolored; base of baculum not dumbell-shaped in cross section.
15. Hairs of throat plumbeous basally; baculum a long, slender rod. . . . . *N. lepida*, p. 689
15′. Hairs of throat white to base; baculum with expanded base that is shallowly u-shaped in cross section. . . . . *N. albigula*, p. 686
14′. Tail not sharply bicolored; baculum short and with much expanded base that is dumbell-shaped in cross section. . . . . *N. fuscipes*, p. 699
13′. Not occurring in western Sonora or Baja California.
16. Anterointernal re-entrant angle of M1 extending less than half way across crown.
17. Tail unicolored. . . . . *N. nelsoni*, p. 688
17′. Tail sharply bicolored.
18. Sphenopalatine vacuities present.
19. Frontals moderately broad posteriorly, their sides projecting only slightly.
20. Palate with posterior median spine; posterior half of septum that divides anterior palatine foramina lacking a foramen; upper parts slaty gray (except in *N. m. littoralis*). . . . . *N. micropus*, p. 685
20′. Palate lacking posterior median spine; or if the spine is present, then posterior half of septum that divides anterior palatine foramina perforated by a foramen; upper parts not slate gray.
21. Hairs on throat white to base (except *N. a. melanura*—see 23′ below). *N. albigula*, p. 686
21′. Hairs on throat plumbeous basally.
22. Hind foot less than 35. . . . . *N. goldmani*, p. 694
22′. Hind foot more than 35.
23. Occurring in eastern México. . . . . *N. montezumae*, p. 689
23′. Occurring in western México. . . . . *N. a. melanura*, p. 688
19′. Frontals markedly broadened posteriorly, their sides strongly projecting as supraorbital shelves. . . . . *N. latifrons*, p. 688
18′. Sphenopalatine vacuities absent. . . . . *N. palatina*, p. 689
16′. Anterointernal re-entrant angle of M1 extending more than half way across tooth.
24. Occurring south of México.
25. Zygomatic arches parallel or almost so; total length usually less than 370. *N. mexicana*, p. 695
25′. Zygomatic arches strongly convergent anteriorly; total length usually more than 370. *N. chrysomelas*, p. 698
24′. Occurring in México.
26. Total length more than 370, occurring in Tamaulipas. . . . *N. angustapalata*, p. 699
26′. Total length less than 370, not occurring in Tamaulipas. . . . *N. mexicana*, p. 695

floridana-group

Neotoma floridana

Eastern Wood Rat

External measurements: 310–441; 129–203; 35–46. Upper parts varying from pale cinnamon to buffy gray, sides fairly distinct from back; underparts white or grayish, the plumbeous of the hairs showing through clearly, especially on the belly; tail shorter than head and body, sparsely haired, not sharply bicolored, dusky or brownish above, whitish to gray below. Skull large, elongated; premaxillary tongues extending posteriorly beyond nasals; sphenopalatine vacuities relatively small; interpterygoid fossa broad; presphenoid constricted; auditory bullae relatively small, rounded; palate lacking posterior median spine; M1 with moderately developed anterointernal re-entrant angle.

Habits vary much according to locality. Nests are made in holes in the ground, in trees, and, perhaps preferably, in rocky outcrops. The food is almost any edible plant material and probably some animal material.

Breeding, at least in southeastern states, occurs throughout the year. Gestation presumably is 33 to 42 days. There are 1–4 young per litter.

Neotoma floridana attwateri Mearns

1897. *Neotoma attwateri* Mearns, Proc. U.S. Nat. Mus., 19:721, July 30, type from Lacey's Ranch, Turtle Creek, Kerr Co., Texas.
1901. [*Neotoma floridana*] *attwateri*, Elliot, Field Columb. Mus., Publ. 45, Zool. Ser., 2:157, March 6.

MARGINAL RECORDS.—Texas: Tehuacana Creek, S of Waco (Strecker, 1929:220); Navasota (Goldman, 1910: 26); Victoria (*ibid.*); Rock Springs (*ibid.*).

Neotoma floridana baileyi Merriam

1894. *Neotoma baileyi* Merriam, Proc. Biol. Soc. Washington, 9:123, July 2, type from Valentine, Cherry Co., Nebraska.
1905. *Neotoma floridana baileyi*, V. Bailey, N. Amer. Fauna, 25:109, October 24.

MARGINAL RECORDS (Goldman, 1910:25).—South Dakota: Spring Creek, 18 mi. SE Rapid City. Nebraska: type locality; Cody.

Neotoma floridana campestris J. A. Allen

1894. *Neotoma campestris* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:322, November 7, type from Pendennis, Lane Co., Kansas.
1914. *Neotoma floridana campestris*, R. Kellogg, Kansas Univ. Mus. Nat. Hist., Publ. 1, Zool. Ser., 1(1):5, January 30.

MARGINAL RECORDS.—Nebraska: 5 mi. N, 2 mi. W Parks (Jones, 1954:485). Kansas (Cockrum, 1952:189): 7 mi. N, 16½ mi. W Atwood; 6 mi. SW Woodston; Hays; type locality; 4¾ mi. E, 9 mi. S Wallace. Colorado (previous records assigned to *campestris* on geographic grounds following study of Coloradan specimens at Univ. Kansas): Fort Lyons (Warren, 1942:209); Pueblo (Miller, 1924: 377); 2 mi. W, 3 mi. S Fountain, 5600 ft. (37094 KU); Cedar Point, 6 mi. NW Limon (Warren, 1942:209); Wray (Goldman, 1910:25).

Neotoma floridana floridana (Ord)

1818. *Mus floridanus* Ord, Bull. Soc. Philom. Paris, p. 181, December, type from St. Johns River, Florida; probably near Jacksonville, Duval Co. (See Bangs, Proc. Boston Soc. Nat. Hist., 28:184, March, 1898.)
1825. *N*[*eotoma*]. *floridana*, Say and Ord, Jour. Acad. Nat. Sci. Philadelphia, 4(2):346.

MARGINAL RECORDS.—North Carolina: Smith Island, Brunswick Co. (Schwartz and Odum, 1957:205), thence down coast to Florida: Sebastian (Sherman, 1937:120); Murdock (Sherman, 1945:201); Tallahassee (Schwartz and Odum, 1957:205). Georgia (*ibid.*): Reynold's Refuge, Dougherty Co.; S of Macon. South Carolina: 1 mi. SW Ellenton (*ibid.*).

Neotoma floridana haematoreia A. H. Howell

1934. *Neotoma floridana haematoreia* A. H. Howell, Proc. Acad. Nat. Sci. Philadelphia, 86:403, October 15, type from near summit Blood Mtn., 4440 ft., Lumpkin Co., Georgia.

MARGINAL RECORDS.—Tennessee: 3 mi. above Townsend, on Little River (Kellogg, 1939:282–283). South Carolina: 1¼ mi. from Caesar's Head Hotel, Geer Highway, 3000 ft. (Coleman, 1949:200). Georgia: type locality.

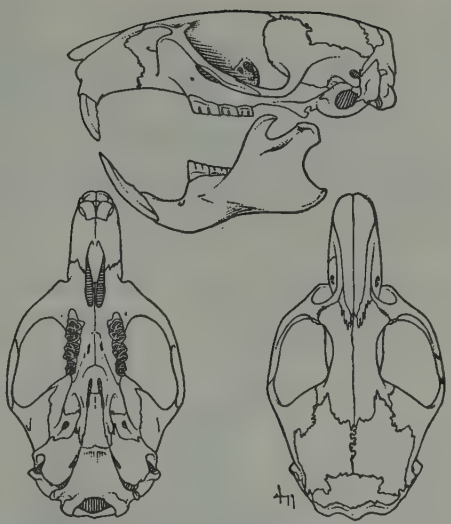


Fig. 378. *Neotoma floridana osagensis*, 5 mi. N and 12 mi. E Arkansas City, Cowley Co., Kansas, No. 39283 K.U., ♂, X 1.

Neotoma floridana illinoensis A. H. Howell

1910. *Neotoma floridana illinoensis* A. H. Howell, Proc. Biol. Soc. Washington, 23:28, March 23, type from Wolf Lake, Union Co., Illinois.

MARGINAL RECORDS.—Missouri: Black (Schwartz and Odum, 1957:205). Illinois: Aldridge (Necker and Hatfield, 1941:53). Alabama: Sand Mtn., Jackson Co. (Schwartz and Odum, 1957:205). Florida: Marianna (*ibid.*). Texas: Texarkana (Kelson, 1952:236).

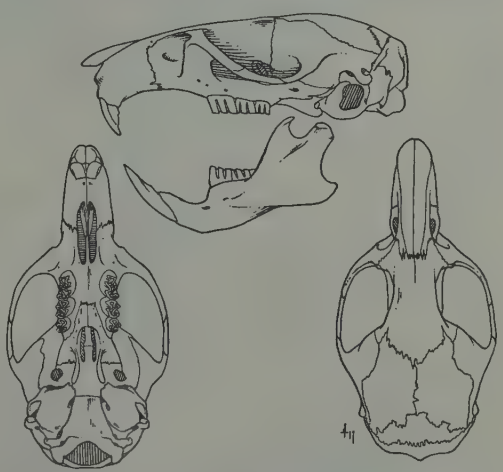


Fig. 379. *Neotoma floridana magister*, 2¾ mi. NW Lenhartsville, 800 ft., Berks Co., Pennsylvania, No. 38640 C.M.N.H., ♂, X 1.

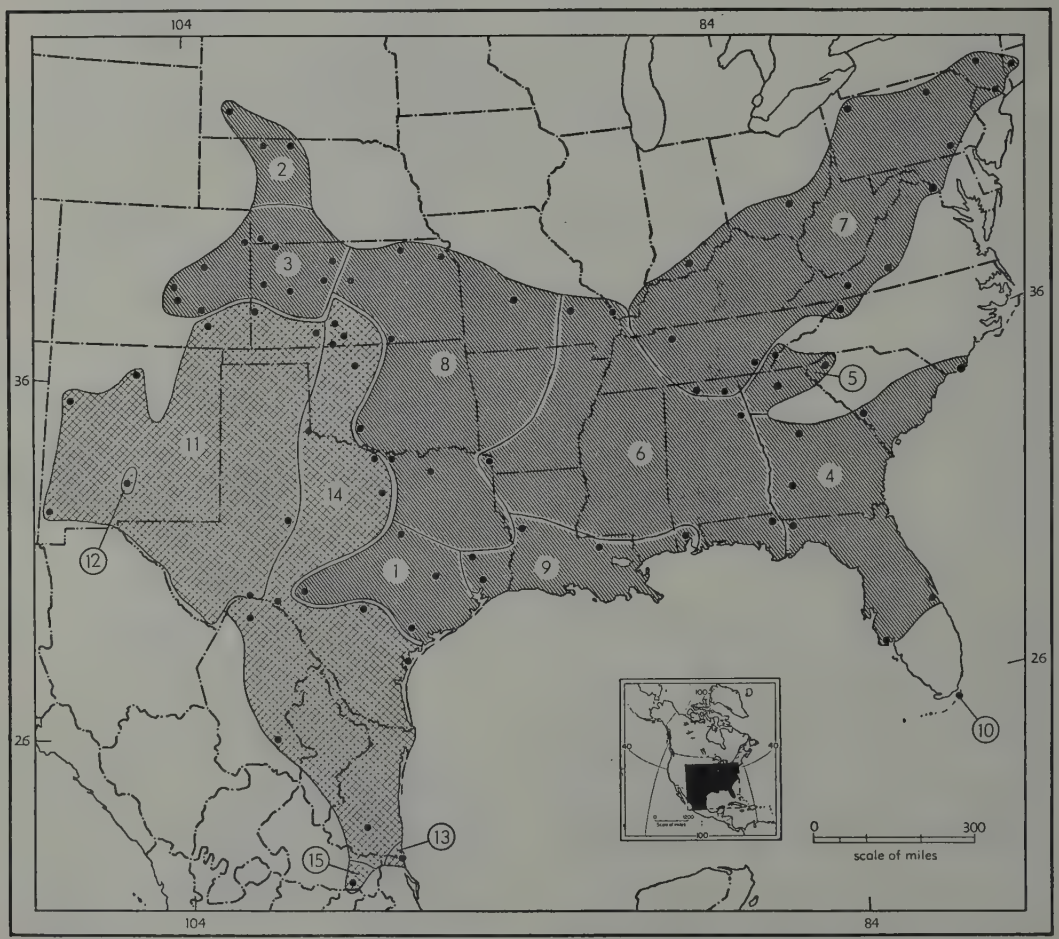
Neotoma floridana magister Baird

1858. *N[eotoma]. magister* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):498, July 14, type from a cave near Carlisle, Cumberland Co., or near Harrisburg, Dauphin Co., Pennsylvania.

1957. *Neotoma floridana magister,* Schwartz and Odum, Jour. Mamm., 38:204, May 27.

1893. *Neotoma pennsylvanica* Stone, Proc. Acad. Nat. Sci. Philadelphia, 45:16, type from near top South Mtn., Cumberland Co., Pennsylvania, some 6 mi. from Pine Grove at a place known as Lewis' Cave.

MARGINAL RECORDS.—New York: Lake Mohonk (Poole, 1940:251). Connecticut: Scattergoat Mtn., near Kent (Goodwin, 1932:38). New York: near Peirmont (375/38468 NM). Pennsylvania: Lancaster County (Roberts and Early, 1952:52). Maryland: Plummer Island (V. Bailey, 1923:115). Virginia (Handley and Patton, 1947:167): Bedford County; Wythe County. North Carolina: Grandfather Mtn., Avery Co., 4100 ft. (Schwartz and Odum, 1957:205). Tennessee: Walden Ridge, near Soddy, 3 mi. SW Rathburn (Kellogg, 1939:283). Alabama (A. H. Howell, 1921:54): Woodville; N shore Muscle Shoals, 10 mi. SE Florence. Tennessee: Duck River, 2 mi. SW Waverly (Kellogg, 1939:



Map 388. Two species of *Neotoma.*

1. *N. floridana attwateri*
2. *N. floridana baileyi*
3. *N. floridana campestris*
4. *N. floridana floridana*
5. *N. floridana haematoreia*
6. *N. floridana illinoensis*
7. *N. floridana magister*
8. *N. floridana osagensis*
9. *N. floridana rubida*
10. *N. floridana smalli*
11. *N. micropus canescens*
12. *N. micropus leucophaea*
13. *N. micropus littoralis*
14. *N. micropus micropus*
15. *N. micropus planiceps*

283). Indiana: just W of Valeene (Kirkpatrick and Conway, 1948:135). Ohio: Sugar Grove (Poole, 1940:251). Pennsylvania: 1 mi. SW Utica (Richmond and Roslund, 1950:198); Lycoming County (Roslund, 1951:46).

Neotoma floridana osagensis Blair

1939. *Neotoma floridana osagensis* Blair, Occas. Papers Mus. Zool., Univ. Michigan, 403:5, June 16, type from Okesa, Osage Co., Oklahoma.

MARGINAL RECORDS.—Kansas: 2 mi. S Marysville (Rainey, 1956:634); Leavenworth County (Cockrum, 1952: 190). Missouri: Hahatonka (on geographic grounds; from Moore, 1938:503). Texas: 5 mi. N Greenville (Baker, 1942:343); Marysville (Kelson, 1952:236). Oklahoma: Chattanooga (Blair, 1939:124). Kansas (Cockrum, 1952: 190): 3 mi. SE Arkansas City; Smoky Hill River, 3 mi. S Wilson.

Neotoma floridana rubida Bangs

1898. *Neotoma floridana rubida* Bangs, Proc. Boston. Soc. Nat. Hist., 28:185, March, type from Gibson, Terrebonne Parish, Louisiana.

MARGINAL RECORDS.—Louisiana: ½ mi. N Simpson (Schwartz and Odum, 1957:205); Jackson (Lowery, 1936: 29). Alabama: Mobile (Schwartz and Odum, 1957:205). Texas: Sour Lake (Goldman, 1910:23); N of Camden along Neches River (Baker, 1942:343).

Neotoma floridana smalli Sherman

1955. *Neotoma floridana smalli* Sherman, Jour. Mamm., 36: 119, February 25, type from Key Largo, Monroe Co., Florida. Known only from type locality.

micropus-group

Neotoma micropus

Southern Plains Wood Rat

External measurements: 300–380; 120–185; 34–41. Upper parts steely to slaty gray, sometimes washed faintly with buff (*N. m. littoralis* and occasional specimens of *N. m. micropus* from southern Texas are distinctly brownish); underparts gray on belly, white on gular and pectoral regions; tail dusky above, whitish below. Skull generally similar to that of *N. floridana* but more robust and sculptured; interpterygoid fossa broad; palate usually with posterior median spine; sphenopalatine vacuities large; palatal bridge relatively short; anterior palatine foramina relatively long; anterointernal reentrant angle of M1 shallow.

Like most other species, the southern plains wood rat builds stick houses for a homesite. The litter contains 2–3 young which are born in late spring after a gestation period of about 33 days.

Neotoma micropus canescens J. A. Allen

1891. *Neotoma micropus canescens* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:285, June 30, type from North Beaver Creek [= North Canadian River], Cimarron Co., Oklahoma.

MARGINAL RECORDS.—Kansas (Cockrum, 1952:191): Coolidge; Stephenson Ranch, 7 mi. S Kingsdown. Texas (Goldman, 1910:29): Colorado; Lozier (*ibid.*). New Mexico: 6 mi. SSE Lordsburg (44622 KU); 8 mi. SE Grants (Hooper, 1941:32); Rinconada (Goldman, 1910:29). Colorado (*ibid.*): 18 mi. S La Junta.—Anderson and Ogilvie (1957:35) list the species from *3½ mi. ESE Los Lamentos, Chihuahua.*

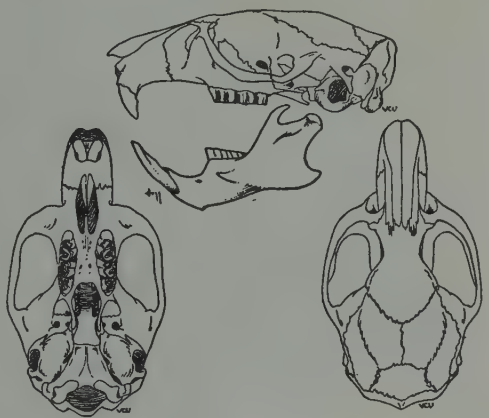


Fig. 380. *Neotoma micropus canescens*, State Park, Meade Co., Kansas, No. 12753 K.U., ♂, X 1.

Neotoma micropus leucophaea Goldman

1933. *Neotoma micropus leucophaea* Goldman, Jour. Washington Acad. Sci., 23:472, October 15, type from White Sands, 10 mi. W Point of Sands, White Sands National Monument, 4100 ft., Otero Co., New Mexico. Known only from the type locality.

Neotoma micropus littoralis Goldman

1905. *Neotoma micropus littoralis* Goldman, Proc. Biol. Soc. Washington, 18:31, February 2, type from Altamira, 1000 ft., Tamaulipas. Known only from the type locality.

Neotoma micropus micropus Baird

1855. *Neotoma micropus* Baird, Proc. Acad. Nat. Sci. Philadelphia, 7:333, April, type from Charco Escondido, Tamaulipas.

1899. *Neotoma macropus* [*sic*] *surberi* Elliot, Field Columb. Mus., Publ. 37, Zool. Ser., 1(14):279, May 15, type from 3 mi. W Alva, Woods Co., Oklahoma.

MARGINAL RECORDS (Goldman, 1910:28, unless otherwise noted).—Kansas (Cockrum, 1952:191): 5 mi. N Belvidere; 8 mi. SW Medicine Lodge. Oklahoma: 5 mi. W Orienta (Blair, 1939:125). Texas: Henrietta; Brazos; San Antonio; Rockport, thence southward along coast to Tamaulipas: Forlón. Coahuila: 3 mi. N, 5 mi. W La Rosa, 3600 ft. (49586 KU); Cañon del Cochino, 3200 ft., 16 mi. N, 21 mi. E Piedras Blanca (36314 KU). Texas: Comstock; Newlin. Kansas: Cave Creek (Cockrum, 1952:191).

Neotoma micropus planiceps Goldman

1905. *Neotoma micropus planiceps* Goldman, Proc. Biol. Soc. Washington, 18:32, February 2, type from Río Verde, 3000 ft., San Luis Potosí. Known only from the type locality.

albigula-group
Neotoma albigula
White-throated Wood Rat

External measurements: 282–400; 76–185; 30–38.5. Upper parts grayish washed with fulvous to ochraceous mixed with dusky; underparts white or grayish, individual hairs plumbeous basally except on throat where they are white to the base; tail brownish or even dusky above, whitish below. Skull with relatively broad rostrum; audital bullae of moderate size; sphenopalatine vacuities large; anterointernal re-entrant angle of M1 shallow.

The species *N. albigula* is placed after *N. micropus* and before *N. lepida* on the basis of characteristics of the baculum as described and figured by Burt and Barkalow (1942:290–292).

This species inhabits primarily the arid to semiarid plains and deserts. It breeds from April to September and possibly the year around in southern latitudes; 1–3 young are born after a gestation period of about 30 days.

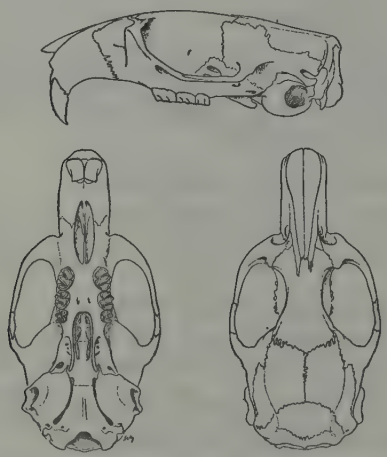


Fig. 381. *Neotoma albigula venusta*, Carrizo Creek, San Diego Co., California, No. 7559 M.V.Z., ♂, X 1.

Neotoma albigula albigula Hartley

1894. *Neotoma albigula* Hartley, Proc. California Acad. Sci., ser. 2, 4:157, May 9, type from vicinity of Fort Lowell, near Tucson, Pima Co., Arizona.

1894. *Neotoma intermedia angusticeps* Merriam, Proc. Biol. Soc. Washington, 9:127, July 2, type from northwest corner Hidalgo Co., New Mexico.

MARGINAL RECORDS (Goldman, 1910:33, unless otherwise noted).—New Mexico: Chama Canyon; 25 mi. SW Tucumcari. Texas: Washburn (Blair, 1954b:253, as *N. a. robustus*); Randall County (Tamsitt, 1954:54); Armstrong County (*ibid.*); Cottle County (*ibid.*); Llano; Black Gap region, Brewster Co. (Blair, 1954a:239, on geographical grounds); The Basin, 5200 ft., Chisos Mts. (Borell and Bryant, 1942:36). Coahuila: Fortín, 3300 ft. (45023 KU); Monclova; Jaral; Jimulco. Durango: Mapimí. Chihuahua: Santa Rosalía; Santa Eulalia. Sonora: Hermosillo (Burt, 1938:63). Arizona: Nogales. Sonora: Santo Domingo (Burt, 1938:63). Arizona: Big Sandy Creek; Hualpai; Havasu Canyon (V. Bailey, 1935:16).

Neotoma albigula brevicauda Durrant

1934. *Neotoma albigula brevicauda* Durrant, Jour. Mamm., 15:65, February 16, type from Castle Valley, about 15 mi. NE Moab, Grand Co., Utah.

MARGINAL RECORDS.—Utah: type locality. Colorado: 1 mi. S Gateway, 4600 ft. (34748 KU); 1 mi. NE Naturita, 5900 ft. (34756 KU).

Neotoma albigula durangae J. A. Allen

1903. *Neotoma intermedia durangae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:602, November 12, type from San Gabriel, Durango.

1910. *Neotoma albigula durangae*, Goldman, N. Amer. Fauna, 31:37, October 19.

MARGINAL RECORDS (Goldman, 1910:38).—Chihuahua: Parral. Durango: type locality; Durango; Rancho Bailón.

Neotoma albigula laplataensis F. W. Miller

1933. *Neotoma albigula laplataensis* F. W. Miller, Proc. Colorado Mus. Nat. Hist., 12(1):2, July 22, type from near Bondad, La Plata Co., Colorado.

MARGINAL RECORDS.—Utah: Recapture Canyon, 12 mi. N. Blanding, 6000 ft. (Durrant, 1952:336). Colorado: 2 mi. S, 4 mi. W Cortez, 5900 ft. (29181 KU); *2 mi. NE Bondad, 6100 ft.* (34763 KU); type locality. Utah (Durrant, 1952:336): *Navajo Mtn.*; Rainbow Bridge, 4000 ft.

Neotoma albigula leucodon Merriam

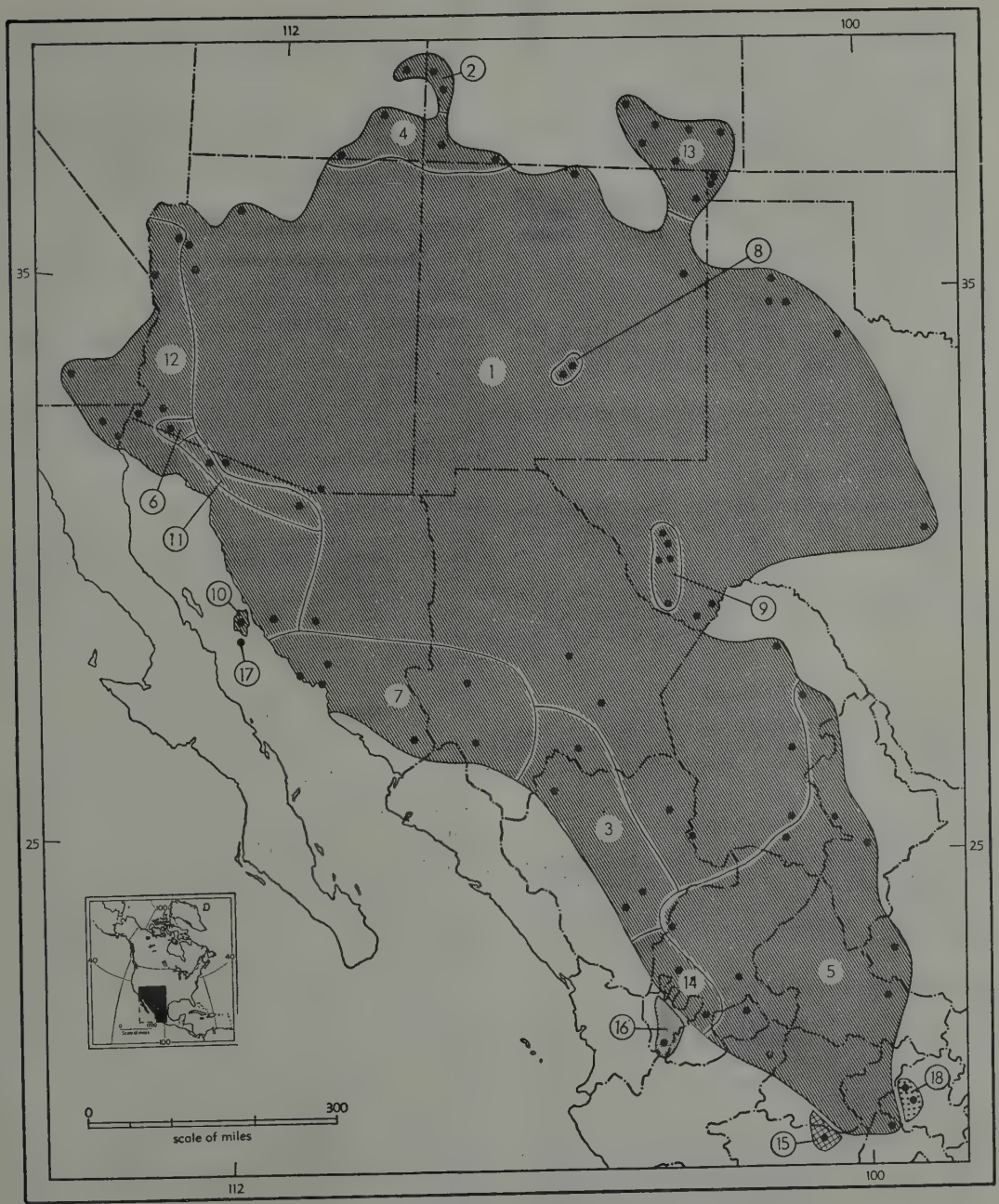
1894. *Neotoma leucodon* Merriam, Proc. Biol. Soc. Washington, 9:120, July 2, type from San Luis Potosí, San Luis Potosí.

1910. *Neotoma albigula leucodon*, Goldman, N. Amer. Fauna, 31:36, October 19.

MARGINAL RECORDS (Goldman, 1910:37, unless otherwise noted).—Coahuila: 6 mi. E Hermanas (56718 KU). Nuevo León: Santa Catarina; Ojo de Agua (Koestner, 1941:13). Tamaulipas: Jaumave. San Luis Potosí: 10 mi. NW Ciudad del Maíz (Dalquest, 1953b:160). México: Márques. Jalisco: Lagos. Aguascalientes: ½ mi. W Rincón de Romos (Hooper, 1955:22). Zacatecas: Berriozabál; 4 mi. E Calabazal (Hooper, 1955:22). Coahuila: 10 mi. S, 5 mi. W General Cepeda, 6500 ft. (56869 KU).

Neotoma albigula mearnsi Goldman

1915. *Neotoma albigula mearnsi* Goldman, Proc. Biol. Soc. Washington, 28:135, June 29, type from Tinajas Altas,



Map 389. Five species of *Neotoma*.

Guide to kinds

1. *N. albigula albigula*
2. *N. albigula brevicauda*
3. *N. albigula durangae*
4. *N. albigula laplataensis*
5. *N. albigula leucodon*
6. *N. albigula mearnsi*
7. *N. albigula melanura*
8. *N. albigula melas*
9. *N. albigula robusta*
10. *N. albigula seri*
11. *N. albigula sheldoni*
12. *N. albigula venusta*
13. *N. albigula warreni*
14. *N. albigula zacatecae*
15. *N. latifrons*
16. *N. palatina*
17. *N. varia*
18. *N. montezumae*

Gila Mts., Yuma Co., Arizona. Known only from the type locality.

Neotoma albigula melanura Merriam

1894. *Neotoma intermedia melanura* Merriam, Proc. Biol. Soc. Washington, 9:126, July 2, type from Ortiz, Sonora.
1905. *N[eotoma]. a[lbigula]. melanura,* Goldman, Proc. Biol. Soc. Washington, 18:29, February 2.

MARGINAL RECORDS.—Sonora: type locality. Chihuahua: Mojarachic (Knobloch, 1942:298); Batopilas (Goldman, 1910:36). Sonora (Burt, 1938:64): Alamos; Batamotal; Bahía San Pedro.

Neotoma albigula melas Dice

1929. *Neotoma albigula melas* Dice, Occas. Papers Mus. Zool., Univ. Michigan, 203:3, June 19, type from Malpais Spring, malpais lava beds near Carrizozo, Lincoln Co., New Mexico.

MARGINAL RECORDS.—New Mexico: 13 mi. NW Carrizozo (Bradt, 1932:324); type locality.

Neotoma albigula robusta Blair

1939. *Neotoma albigula robusta* Blair, Occas. Papers Mus. Zool., Univ. Michigan, 403:3, June 16, type from Limpia Canyon, 4300 ft., 16 mi. N Fort Davis, Jeff Davis Co., Texas.

MARGINAL RECORDS (Blair, 1940:32, unless otherwise noted).—Texas: type locality; Paisano; Marfa; La Mota Mtn. area (Tamsitt, 1954:53); Limpia Canyon, 2 mi. NW Fort Davis.

Neotoma albigula seri Townsend

1912. *Neotoma albigula seri* Townsend, Bull. Amer. Mus. Nat. Hist., 31:125, June 14, type from Tiburón Island, Gulf of California, Sonora. Known only from the type locality.

Neotoma albigula sheldoni Goldman

1915. *Neotoma albigula sheldoni* Goldman, Proc. Biol. Soc. Washington, 28:136, June 29, type from Papago Tanks, Sierra Pinacate, Sonora.

MARGINAL RECORDS.—Sonora: type locality; Sáric (Burt, 1938:63).

Neotoma albigula venusta True

1894. *Neotoma venusta* True, Diagnoses of some undescribed wood rats (genus *Neotoma*) in the National Museum, p. 2, June 27 (preprint of Proc. U.S. Nat. Mus., 17: 354, November 15, 1894), type from Carrizo Creek, Imperial Co., California.
1910. *Neotoma albigula venusta,* Goldman, N. Amer. Fauna, 31:33, October 19.
1897. *Neotoma cumulator* Mearns, Preliminary diagnoses of new mammals of the genera *Sciurus, Castor, Neotoma,* and *Sigmodon,* from the Mexican border of the United States, p. 3, March 5 (preprint of Proc. U. S. Nat. Mus., 20:503, January 19, 1898), type from old Fort Yuma, Imperial Co., California, on right bank of Colorado River opposite present town of Yuma, Arizona.
1904. *Neotoma desertorum grandis* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):247, January 7, type from Cameron Lake, Kern Co., California (?; see Grinnell, 1933:178).

MARGINAL RECORDS (Goldman, 1910:34, unless otherwise noted).—Arizona: Dolans Spring; Adonde; Yuma. Sonora: Costa Rica Ranch (Burt, 1938:64). Baja California: Colonia Lerdo; E base Cocopah Mts. California: Borrego Spring. Arizona: Fort Mohave.

Neotoma albigula warreni Merriam

1908. *Neotoma albigula warreni* Merriam, Proc. Biol. Soc. Washington, 21:143, June 9, type from Gaume Ranch, 4600 ft., northwest corner Baca Co., Colorado.

MARGINAL RECORDS.—Colorado: 2 mi. E Wetmore, 5700 ft. (37102 KU); junction Huerfano and Cucharas rivers (Warren, 1942:213); 3 mi. NW Higbee, 4300 ft. (Finley, 1954:111); Two Buttes Peak, 4500 ft. (37125 KU). Oklahoma: Regnier, 4500 ft. (41078 KU); Kenton (Blair, 1939:125). New Mexico: Clayton (Warren, 1942:212). Colorado: 11 mi. N, 8 mi. E Branson, 5600 ft. (37120 KU); 9 mi. SW Walsenburg, 6600 ft. (37103 KU).

Neotoma albigula zacatecae Goldman

1905. *Neotoma leucodon zacatecae* Goldman, Proc. Biol. Soc. Washington, 18:30, February 2, type from Plateado, 7600 ft., Zacatecas.
1910. *Neotoma albigula zacatecae* Goldman, N. Amer. Fauna, 31:38, October 19.

MARGINAL RECORDS.—Zacatecas: Valparaíso (Goldman, 1910:38); type locality.

Neotoma latifrons Merriam
Queréndaro Wood Rat

1894. *Neotoma latifrons* Merriam, Proc. Biol. Soc. Washington, 9:121, July 2, type from Queréndaro, Michoacán. Known only from type locality.

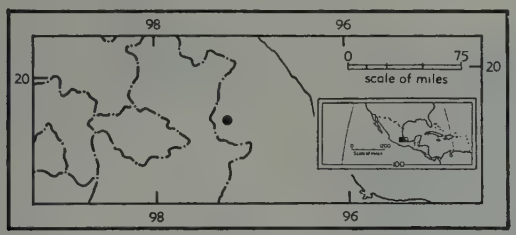
External measurements of the type, an adult male, the only known specimen, are: 350; 149; 34.5 (dry). "Upper parts ochraceous buffy, purest along cheeks and sides, moderately darkened dorsally by dusky hairs; middle of face grayish; nose and upper lip dusky; feet white; under parts dull white, the fur on pectoral and inguinal regions . . . pure white to roots; tail dusky above, dull white below" (Goldman, 1910:39).

Neotoma nelsoni Goldman
Nelson's Wood Rat

1905. *Neotoma nelsoni* Goldman, Proc. Biol. Soc. Washington, 18:29, February 2, type from Perote, 7800 ft., Veracruz. Known only from the type locality.

Average external measurements of 5 topotypes are: 349; 154; 38. Upper parts pale cinnamon heavily overlaid with brown, especially mid-dor-

sally; underparts dull white over plumbeous except on a small pectoral area where hairs are white to base; feet white; tail faintly bicolored, smoky brown above, paler below.



Map 390. *Neotoma nelsoni.*

Neotoma palatina Goldman
Bolaños Wood Rat

1905. *Neotoma palatina* Goldman, Proc. Biol. Soc. Washington, 18:27, February 2, type from Bolaños, 2800 ft., Jalisco. Known only from the type locality. See Map 389.

External measurements of the only known specimen, an adult male, are: length of head and body, 187; hind foot, 37. Upper parts pale cinnamon washed with buffy along cheeks and sides, much darker dorsally owing to admixture of black hairs; underparts dull white, hairs plumbeous basally except on throat, chest, inguinal region; tail sparsely haired, blackish above, whitish below. Skull large, robust; smoothly rounded; well arched at level of anterior zygomatic root; rostrum short, robust; frontals large, sides slightly upturned; interpterygoid fossa especially broad, rounded anteriorly; sphenopalatine vacuities absent; vomer markedly prolonged posteriorly, terminating at presphenoid-basiphenoid suture; auditory bullae small but robust.

Neotoma varia Burt
Turner Island Wood Rat

1932. *Neotoma varia* Burt, Trans. San Diego Soc. Nat. Hist., 7:178, October 31, type from Turner Island (lat. 28° 43′ N, long. 112° 19′ W), Gulf of California, Sonora. Known only from the type locality. See Map 389.

External measurements of the type, an adult female, the only known specimen, are: 305; 140; 33. Differs from contiguous subspecies of *Neotoma albigula* in minor details except those of dentition. In *varia* the molar tooth-row is convex laterally rather than straight and M3 has two rather than three lobes and consequently one rather than two external re-entrant angles. The constancy of these unusual deviations from the usual pattern found in the *albigula*-group is unknown until additional specimens of *varia* are studied.

Neotoma montezumae Goldman
Montezuma's Wood Rat

1905. *Neotoma montezumae* Goldman, Proc. Biol. Soc. Washington, 18:29, February 2, type from Zimapán, 7500 ft., Hidalgo.

External measurements of the type, an adult male, are: length of head and body, 181; hind foot, 39. Upper parts dull ochraceous buff much darkened by brown and dusky hairs; underparts as in *N. palatina*; feet white; tail blackish above, white below. Skull much as in *N. albigula*, but more robust; maxillary arm of zygoma more robust; dentition much broader; anterointernal re-entrant angle of M1 deeper; premaxillary tongues long, reaching, or almost reaching, level of interorbital constriction.

MARGINAL RECORDS.—Hidalgo: type locality; Ixmiquilpán (Goldman, 1910:42). See Map 389.

lepida-group

See Goldman, Jour. Mamm., 13:59–67, February 9, 1932, for revised list of subspecies.

Neotoma lepida
Desert Wood Rat

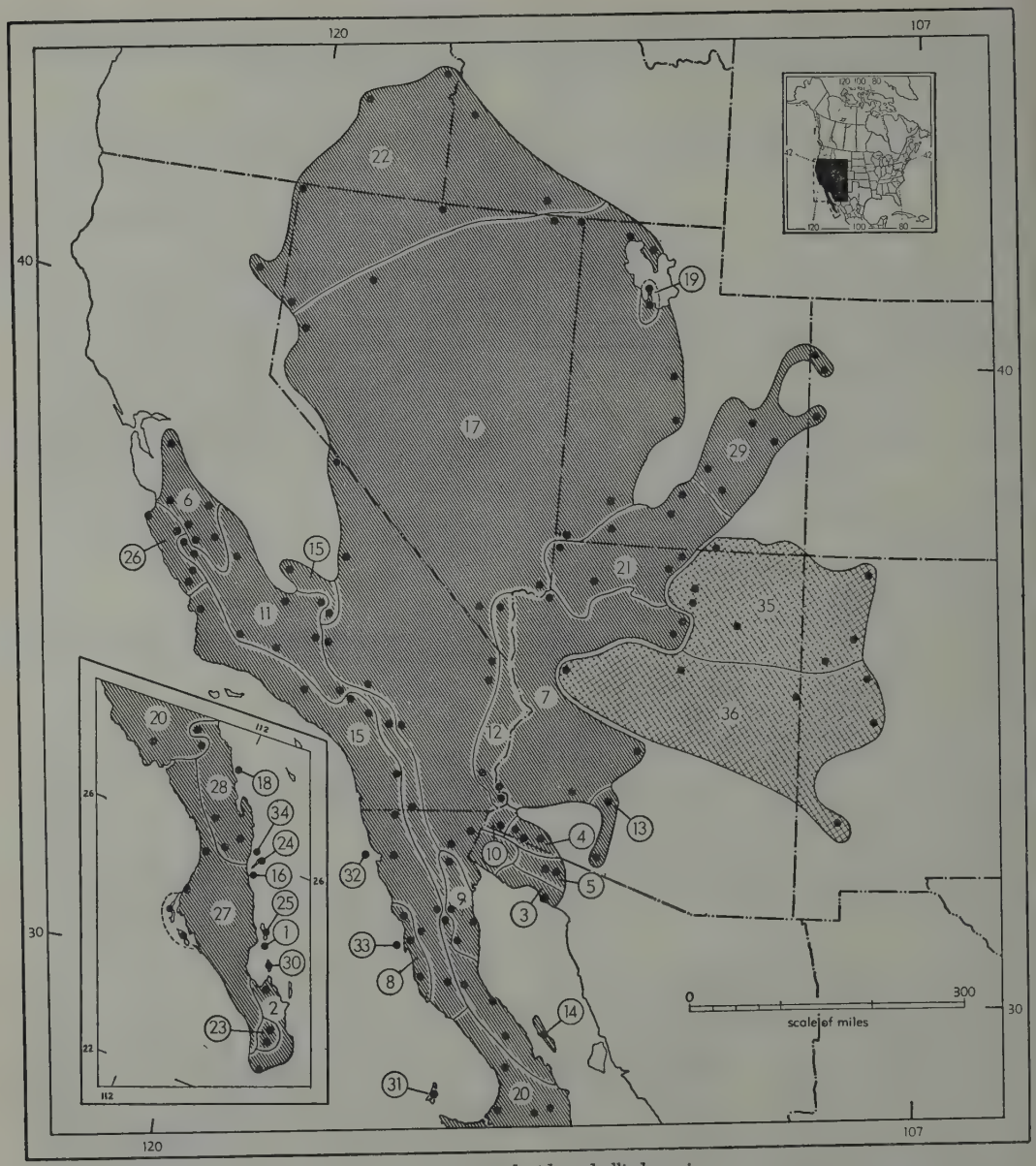
External measurements: 225–383; 95–188; 28–41. Upper parts varying much according to subspecies but usually approximately buffy gray; underparts grayish or faintly buffy, all hairs plumbeous basally; tail bicolored, dark gray or dusky above, pale gray below. Skull robust, sculptured; audital bullae well inflated; interpterygoid space moderately broad posteriorly, but variable in shape anteriorly; anterointernal angle of M1 shallow.

This is a desert-dwelling species. The houses often are on level ground and consist of a pile of sticks and debris at the base of a cactus or shrub. The animals climb among the sharp cactus spines seemingly with impunity; often the entrances to the houses are almost paved with spines, much to the collector's dismay. Occasionally burrows are made in clay banks, especially where there is some overhang.

A litter of 1–5 (usually 3) young is born in a relatively altricial state in late winter or spring.

Neotoma lepida abbreviata Goldman

1909. *Neotoma abbreviata* Goldman, Proc. Biol. Soc. Washington, 22:140, June 25, type from San Francisco Island



Map 391. *Neotoma lepida* and allied species.

1. *N. lepida abbreviata*
2. *N. lepida arenacea*
3. *N. lepida aureotunicata*
4. *N. lepida auripila*
5. *N. lepida bensoni*
6. *N. lepida californica*
7. *N. lepida devia*
8. *N. lepida egressa*
9. *N. lepida felipensis*
10. *N. lepida flava*
11. *N. lepida gilva*
12. *N. lepida grinnelli*
13. *N. lepida harteri*
14. *N. lepida insularis*
15. *N. lepida intermedia*
16. *N. lepida latirostra*
17. *N. lepida lepida*
18. *N. lepida macrosensis*
19. *N. lepida marshalli*
20. *N. lepida molagrandis*
21. *N. lepida monstrabilis*
22. *N. lepida nevadensis*
23. *N. lepida notia*
24. *N. lepida nudicauda*
25. *N. lepida perpallida*
26. *N. lepida petricola*
27. *N. lepida pretiosa*
28. *N. lepida ravida*
29. *N. lepida sanrafaeli*
30. *N. lepida vicina*
31. *N. bryanti*
32. *N. anthonyi*
33. *N. martinensis*
34. *N. bunkeri*
35. *N. stephensi relicta*
36. *N. stephensi stephensi*

(near southern end of San José Island), Gulf of California, Baja California. Known only from the type locality.

1932. *Neotoma lepida abbreviata*, Burt, Trans. San Diego Soc. Nat. Hist., 7:182, October 31.

Neotoma lepida arenacea J. A. Allen

1898. *Neotoma arenacea* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:150, April 12, type from San José del Cabo, Baja California.

1932. *Neotoma lepida arenacea*, Goldman, Jour. Mamm., 13:65, February 9.

MARGINAL RECORDS.—Baja California: La Paz (Goldman, 1932a:65); Cape San Lucas (Goldman, 1910:47).

Neotoma lepida aureotunicata Huey

1937. *Neotoma lepida aureotunicata* Huey, Trans. San Diego Soc. Nat. Hist., 8:349, June 15, type from Punta Peñascosa, Sonora. Known only from the type locality.

Neotoma lepida auripila Blossom

1933. *Neotoma auripila* Blossom, Occas. Papers Mus. Zool., Univ. Michigan, 273:1, October 31, type from Agua Dulce Mts., 9 mi. E Papago Well, Pima Co., Arizona.

1935. *N[eotoma]. l[epida]. auripila* Blossom, Occas. Papers Mus. Zool., Univ. Michigan, 315:1, May 29.

MARGINAL RECORDS (Blossom, 1933:3).—Arizona: Crow Butte, W side Cabeza Prieta Mts., 9 mi. E Tinajas Atlas; Tule Tank; type locality.

Neotoma lepida bensoni Blossom

1935. *Neotoma lepida bensoni* Blossom, Occas. Papers Mus. Zool., Univ. Michigan, 315:1, May 29, type from Papago Tanks, Sierra Pinacate, Sonora.

MARGINAL RECORDS.—Sonora: type locality; Elegante Cráter, 41 mi. SW Sonoyta (Burt, 1938:65).

Neotoma lepida californica Price

1894. *Neotoma californica* Price, Proc. California Acad. Sci., ser. 2, 4:154, pl. 11, May 9, type from Bear Valley, San Benito Co., California.

1938. *Neotoma lepida californica*, von Bloeker, Proc. Biol. Soc. Washington, 51:201, December 23.

MARGINAL RECORDS (von Bloeker, 1938:202–203, unless otherwise noted).—California: Mt. Diablo (Hooper, 1944:58); Herrero Canyon, 22 mi. S Los Banos; 1 mi. SE summit San Benito Mtn., Gabilan Mts.; Diablo Range, 4 mi. E King City; mouth Stonewall Creek, 4 mi. NE Soledad; Fremont Peak, Gabilan Range (Kelson, 1952:237).

Neotoma lepida devia Goldman

1927. *Neotoma intermedia devia* Goldman, Proc. Biol. Soc. Washington, 40:205, December 2, type from Tanner Tank, 5200 ft., Painted Desert, Arizona.

1932. *Neotoma lepida devia* Goldman, Jour. Mamm., 13:62, February 9.

MARGINAL RECORDS (Benson, 1935:5–6).—Arizona: Hoover Dam Ferry, Colorado River; Cameron; type locality; New River Valley, 30 mi. N Phoenix; base Castle Dome Peak; 10 mi. below Cibola, Colorado River, thence northward east of the Colorado River to point of beginning.

Neotoma lepida egressa Orr

1934. *Neotoma lepida egressa* Orr, Proc. Biol. Soc. Washington, 47:109, June 13, type from 1 mi. E El Rosario, 200 ft., Baja California.

MARGINAL RECORDS (Orr, 1934:110).—Baja California: San Telmo; Arroyo Nuevo York, 15 mi. S Santo Domingo; type locality; thence northward along coast to point of beginning.

Neotoma lepida felipensis Elliot

1903. *Neotoma bella felipensis* Elliot, Field Columb. Mus., Publ. 79, Zool. Ser., 3(12):217, August 15, type from San Felipe, Baja California.

1932. *Neotoma lepida felipensis*, Goldman, Jour. Mamm., 13:64, February 9.

MARGINAL RECORDS (Elliot, 1907:276).—Baja California: Palomar; type locality; Parral; Cañon Viento.

Neotoma lepida flava Benson

1935. *Neotoma lepida flava* Benson, Occas. Papers. Mus. Zool., Univ. Michigan, 317:7, July 1, type from Tinajas Altas, 1150 ft., Yuma Co., Arizona. Known only from the type locality.

Neotoma lepida gilva Rhoads

1894. *Neotoma intermedia gilva* Rhoads, Amer. Nat., 28:70, January, type from Banning, Riverside Co., California.

1932. *Neotoma lepida gilva*, Goldman, Jour. Mamm., 13:63, February 9.

1894. *Neotoma desertorum sola* Merriam, Proc. Biol. Soc. Washington, 9:126, July 2, type from San Emigdio, Kern Co., California.

MARGINAL RECORDS (Goldman, 1910:45–46, unless otherwise noted).—California: Paraiso Springs; Milpitas Ranch; Stanley (Grinnell, 1933:180); Kern River, 15 mi. N Bakersfield; South Fork, Kern River (Grinnell, 1933:180); Tehachapi; Mt. Waterman; Cabezon; Jacumba. Baja California: Calamahué; Yubay; Pozo San Augustín, 20 mi. E San Fernando; Esperanza Canyon, E base Sierra San Pedro Mártir. California: Mt. Piños (Grinnell, 1933:180); Cuyama Valley.

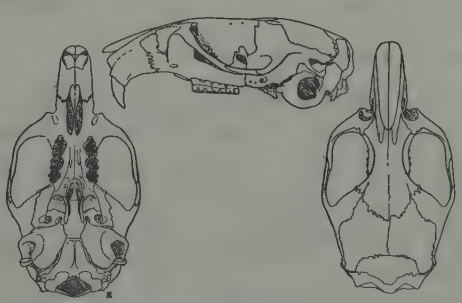


Fig. 382. *Neotoma lepida lepida*, Baker Creek, 7300 ft., Nevada, No. 42031 M.V.Z., ♀, X 1.

Neotoma lepida grinnelli Hall

1942. *Neotoma lepida grinnelli* Hall, Univ. California Publ. Zool., 46(5):369, July 3, type from Colorado River 20 mi. above (by river; about 12½ air-line mi. N) Picacho, Imperial Co., California.

MARGINAL RECORDS.—Nevada: 4½ mi. W Boulder City, 2600 ft. (Hall, 1946:532). California: Pilot Knob (Hall, 1942:369); Beal Well, Chocolate Mts. (*ibid.*).

Neotoma lepida harteri Huey

1937. *Neotoma lepida harteri* Huey, Trans. San Diego Soc. Nat. Hist., 8:351, June 15, type from 10 mi. S Gila Bend (2 mi. N Black Gap), Maricopa Co., Arizona.

MARGINAL RECORDS.—Arizona: type locality; just north of the Growler Mine (Huey, 1942:362).

Neotoma lepida insularis Townsend

1912. *Neotoma insularis* Townsend, Bull. Amer. Mus. Nat. Hist., 31:125, June 14, type from Angel de la Guarda Island, Gulf of California, Baja California. Known only from the type locality.
1932. *Neotoma lepida insularis*, Burt, Trans. San Diego Soc. Nat. Hist., 7:182, October 31.

Neotoma lepida intermedia Rhoads

1894. *Neotoma intermedia* Rhoads, Amer. Nat., 28:69, January, type from Dulzura, San Diego Co., California.
1932. *Neotoma lepida intermedia*, Goldman, Jour. Mamm., 13:64, February 9.

MARGINAL RECORDS (Goldman, 1910:44, unless otherwise noted).—California: San Luis Obispo; San Fernando; San Bernardino Mts. (Grinnell, 1933:180); Redlands; Julian (Grinnell, 1933:180). Baja California: Tecate River; summit San Matías Pass (Huey, 1945:310); San Fernando; Rancho San Antonio, W base Sierra San Pedro Mártir; 20 mi. E Ensenada, thence northward along coast to point of beginning. Also, discontinuously in California: 8 mi. E Porterville (Goldman, 1910:44); Piute Mts. (*ibid.*).

Neotoma lepida latirostra Burt

1932. *Neotoma lepida latirostra* Burt, Trans. San Diego Soc. Nat. Hist., 7:180, October 31, type from Danzante Island, lat. 25° 47′ N, long. 111° 11′ W, Gulf of California, Baja California. Known only from the type locality.

Neotoma lepida lepida Thomas

1893. *Neotoma lepida* Thomas, Ann. Mag. Nat. Hist., ser. 6, 12:235, September, type from somewhere on "Simpson's route" between Camp Floyd [= Fairfield], Utah, and Carson City, Nevada.
1894. *Neotoma desertorum* Merriam, Proc. Biol. Soc. Washington, 9:125, July 2, type from Furnace Creek, Death Valley, Inyo Co., California.
1899. *Neotoma bella* Bangs, Proc. New England Zool. Club, 1:66, July 31, type from Palm Springs, Riverside Co., California.

MARGINAL RECORDS.—Nevada (Hall, 1946:531): Cedar Creek, 10 mi. NE San Jacinto; Goose Creek, 2 mi. W Utah boundary, 5000 ft. Utah (Durrant, 1952:340): Kelton, 4225 ft.; Promontory; 7 mi. SW Nephi, 6000 ft.; Salina; Cedar City; Castle Cliffs, 1 mi. N Beaverdam Wash, 2500 ft. Nevada (Hall, 1946:532): Cedar Basin, 3500 ft.; N side Potosi Mtn., 7000 ft. California (Johnson, *et al.*, 1948:367–368): Purdy; Colton Well. Baja California (Goldman, 1910:78): Cerro Prieto, near volcanic lake; Sierra Cocopah. California: N base San Jacinto Mtn., near Whitewater (Grinnell, 1933:179); Hesperia (Goldman, 1910:78); Mohave (*ibid.*); Owens Lake (*ibid.*); Owens Valley near Benton (Grinnell, 1933:179). Nevada (Hall, 1946:532): 1 mi. SW Pyramid Lake, 3950 ft.; 2 mi. E Antelope, 4400 ft.

Neotoma lepida marcosensis Burt

1932. *Neotoma lepida marcosensis* Burt, Trans. San Diego Soc. Nat. Hist., 7:179, October 31, type from San Marcos Island, lat. 27° 13′ N, long. 112° 05′ W, Gulf of California, Baja California. Known only from the type locality.

Neotoma lepida marshalli Goldman

1939. *Neotoma lepida marshalli* Goldman, Jour. Mamm., 20:357, August 14, type from Carrington Island, about 4250 ft., Great Salt Lake, Tooele Co., Utah.

MARGINAL RECORDS.—Utah: type locality; Stansbury Island (Durrant, 1952:341).

Neotoma lepida molagrandis Huey

1945. *Neotoma lepida molagrandis* Huey, Trans. San Diego Soc. Nat. Hist., 10:307, August 31, type from site of old well near mesalike shelf, some 3 mi. inland from landing beach, Santo Domingo Landing, about 50 ft., lat. 28° 15′ N, Baja California.

MARGINAL RECORDS (Huey, 1945:310, unless otherwise noted).—Baja California: Punta Prieta; Santa Gertrudeis Mission; 12 mi. E El Arco, Rancho Miraflores; San Ignacio; Tinaja Santa Clara, Sierra Santa Clara (Goldman, 1910:46; referred to *molagrandis* on geographic grounds); type locality.

Neotoma lepida monstrabilis Goldman

1932. *Neotoma lepida monstrabilis* Goldman, Jour. Mamm., 13:62, February 9, type from Ryan, 6000 ft., Kaibab National Forest, Coconino Co., Arizona.

MARGINAL RECORDS.—Utah (Durrant, 1952:343): 7 mi. N Escalante, 6500 ft. Arizona (Goldman, 1932a:63): Lee's Ferry; mouth Bright Angel Creek; Trumbull Mts., 3 mi. S Trumbull Springs; Littlefield. Utah (Durrant, 1952: 343): Zion National Park, 4300 ft.; Kaiparowits Plateau.

Neotoma lepida nevadensis Taylor

1910. *Neotoma nevadensis* Taylor, Univ. California Publ. Zool., 5(6):289, February 12, type from Virgin Valley, 4800 ft., Humboldt Co., Nevada.
1946. *Neotoma lepida nevadensis*, Hall, Mammals of Nevada, p. 530, July 1.

MARGINAL RECORDS.—Oregon: Vale (V. Bailey, 1936: 176). Idaho (Davis, 1939:297): 2 mi. S Melba; 8 mi. W Rogerson. Nevada (Hall, 1946:530): 36 mi. NE Paradise

Valley, 5500 ft.; 2¾ mi. E Flanigan, 4250 ft. California: Petes Valley, 12 mi. NE Susanville (Grinnell, 1933:179). Nevada: 12-mile Creek, ½ mi. E California boundary, 5300 ft. (Hall, 1946:530). Oregon: Voltage (V. Bailey, 1936: 176).

Neotoma lepida notia Nelson and Goldman

1931. *Neotoma intermedia notia* Nelson and Goldman, Proc. Biol. Soc. Washington, 44:108, October 17, type from La Laguna, 5500 ft., Sierra de la Victoria, Baja California.
1932. *Neotoma lepida notia,* Goldman, Jour. Mamm., 13: 65, February 9.

MARGINAL RECORDS.—Baja California: type locality; Mt. Miraflores (Nelson and Goldman, 1931:109).

Neotoma lepida nudicauda Goldman

1905. *Neotoma nudicauda* Goldman, Proc. Biol. Soc. Washington, 18:28, February 2, type from Carmen Island, Gulf of California, Baja California. Known only from the type locality.
1932. *Neotoma lepida nudicauda,* Burt, Trans. San Diego Soc. Nat. Hist., 7:182, October 31.

Neotoma lepida perpallida Goldman

1909. *Neotoma intermedia perpallida* Goldman, Proc. Biol. Soc. Washington, 22:139, June 25, type from San José Island, Gulf of California, Baja California. Known only from the type locality.
1932. *Neotoma lepida perpallida* Goldman, Jour. Mamm., 13:65, February 9.

Neotoma lepida petricola von Bloeker

1938. *Neotoma lepida petricola* von Bloeker, Proc. Biol. Soc. Washington, 51:203, December 23, type from Abbotts Ranch, Arroyo Seco, 670 ft., Monterey Co., California.

MARGINAL RECORDS (von Bloeker, 1938:204).—California: Mal Paso Creek, S of Point Lobos; Big Pines, 4000 ft., Santa Lucia Mts.; type locality; Mt. Mars.

Neotoma lepida pretiosa Goldman

1909. *Neotoma intermedia pretiosa* Goldman, Proc. Biol. Soc. Washington, 22:139, June 25, type from Matancita, 100 ft. (also called Soledad), 50 mi. N Magdalena Bay, Baja California.
1932. *Neotoma lepida pretiosa* Goldman, Jour. Mamm., 13:64, February 9.

MARGINAL RECORDS.—Baja California: San Jorge, SW of Comondú (Goldman, 1932a:64); type locality; [Sta.] Margarita Island (*ibid.*); [Sta.] Magdalena Island (Goldman, 1910:47).

Neotoma lepida ravida Nelson and Goldman

1931. *Neotoma intermedia ravida* Nelson and Goldman, Proc. Biol. Soc. Washington, 44:107, October 17, type from Comondú, 700 ft., Baja California.
1932. *Neotoma lepida ravida,* Goldman, Jour. Mamm., 13: 64, February 9.

MARGINAL RECORDS (Nelson and Goldman, 1931: 108).—Baja California: Aguaje de la Natividad, 25 mi. NW San Ignacio; Sierra de la Giganta; type locality; Paso Hondo, 16 mi. N La Purísima.

Neotoma lepida sanrafaeli Kelson

1950. *Neotoma lepida sanrafaeli* Kelson, Jour. Washington Acad. Sci., 39:418, January 9, type from Rock Canyon Corral, 5 mi. SE Valley City, 4500 ft., Grand Co., Utah.

MARGINAL RECORDS.—Colorado: 5 mi. W Rangely, 5600 ft. (148012 BS); 2 mi. E, 18 mi. S Rangely, 6200 ft. (34767 KU); 1½ mi. S Loma, 4600 ft. (34769 KU). Utah (Durrant, 1952:343): type locality; King's Ranch, 5000 ft.; Notom, 6200 ft.; 7 mi. N Greenriver, 4100 ft.

Neotoma lepida vicina Goldman

1909. *Neotoma intermedia vicina* Goldman, Proc. Biol. Soc. Washington, 22:140, June 25, type from Espíritu Santo Island, Gulf of California, Baja California. Known only from the type locality.
1932. *Neotoma lepida vicina* Goldman, Jour. Mamm., 13:65, February 9.

Neotoma bryanti Merriam
Bryant's Wood Rat

1887. *Neotoma bryanti* Merriam, Amer. Nat., 21:191, February, type from Cerros [= Cedros] Island, Baja California. Known only from the type locality.

Average external measurements of 8 topotypes are: 377; 168; 38.1. Upper parts rich creamy buff with strong admixture of black-tipped hairs on top of head and back; underparts creamy white sometimes suffused with pinkish buff; tail brownish above, grayish below. Skull large, angular; frontals broadened abruptly anteriorly, deeply channeled above, lateral margins strongly upturned in nearly straight posteriorly diverging lines; interpterygoid fossa narrow.

Neotoma anthonyi J. A. Allen
Anthony's Wood Rat

1898. *Neotoma anthonyi* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:151, April 12, type from Todos Santos Island, Baja California. Known only from the type locality.

External measurements: 330–345; 132–149; 34–36.3. Upper parts grayish brown becoming darker dorsally owing to admixture of dusky hairs; underparts white with suffusion of pale pinkish buff on throat and belly; feet white; tail bicolored brownish black above, dirty white below. Skull relatively large, robust, and angular; in general resembling that of *N. lepida* but maxillary arm of zygomata more robust, less abruptly spreading; frontals more elevated; anterior palatine foramina larger; teeth larger.

Neotoma martinensis Goldman
San Martín Island Wood Rat

1905. *Neotoma martinensis* Goldman, Proc. Biol. Soc. Washington, 18:28, February 2, type from San Martín Island, Baja California. Known only from the type locality.

Average external measurements of four topotypes are: 352; 165; 37.6. Upper parts creamy buff darkened dorsally by dusky hairs; underparts creamy white, hairs plumbeous basally; tail brownish black above, grayish below. Skull relatively smoothly rounded, high and well arched in profile anteriorly; nasals especially long, reaching well beyond level of lacrimals, abruptly tapering posteriorly; premaxillary tongues extending posteriorly beyond nasals; interorbital region much constricted; zygomatic arches convergent anteriorly; interpterygoid fossa narrow and somewhat constricted; auditory bullae small but with especially large meatus.

Neotoma bunkeri Burt
Bunker's Wood Rat

1932. *Neotoma bunkeri* Burt, Trans. San Diego Soc. Nat. Hist., 7:181, October 31, type from Coronados Island, lat. 26° 06′ N, long. 111° 18′ W, Gulf of California, Baja California. Known only from the type locality.

External measurements of the type are: 390; 168; 43. Upper parts dark gray; underparts deep mouse gray washed with white; tail brownish above, white below. "Skull similar to that of *Neotoma fuscipes macrotis* Thomas but with relatively shorter and broader rostrum, wider antorbital foramina, less rounded audital bullae, and more flattened braincase" (Burt, 1932:181).

Neotoma stephensi
Stephens' Wood Rat

External measurements: 286–312; 135–141; 28–31. Upper parts yellowish to grayish buff, darkened dorsally by dusky hairs; underparts white or creamy, often washed with pinkish buff, fur plumbeous basally except on throat, inner sides forelegs, pectoral and inguinal regions; feet usually white; tail pale gray to grayish brown above, paler below. Skull closely resembling that of *N. lepida* but differing in its most extreme development in being smaller, less angular; braincase more smoothly rounded; zygomata more squarely spreading; frontal region broader and more flattened.

The tail is notably hairier in *N. stephensi* than in *N. lepida*.

Neotoma stephensi relicta Goldman

1932. *Neotoma stephensi relicta* Goldman, Jour. Mamm., 13:66, February 9, type from Keams Canyon, Navajo Co., Arizona.

MARGINAL RECORDS (Goldman, 1932a:67, unless otherwise noted).—Utah: Rainbow Bridge, 4000 ft. (Durrant, 1952:344). New Mexico: Blanco; Bluewater; Ft. Wingate. Arizona: type locality; Tuba; Cedar Ridge, 30 mi. N Tuba.

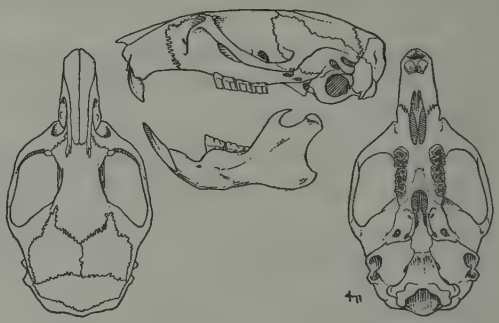


Fig. 383. *Neotoma stephensi stephensi*, Hualpai Mts., Arizona, No. 244156 U.S.N.M., ♂, X 1.

Neotoma stephensi stephensi Goldman

1905. *Neotoma stephensi* Goldman, Proc. Biol. Soc. Washington, 18:32, February 2, type from Hualapai Mts., 6300 ft., Mohave Co., Arizona.

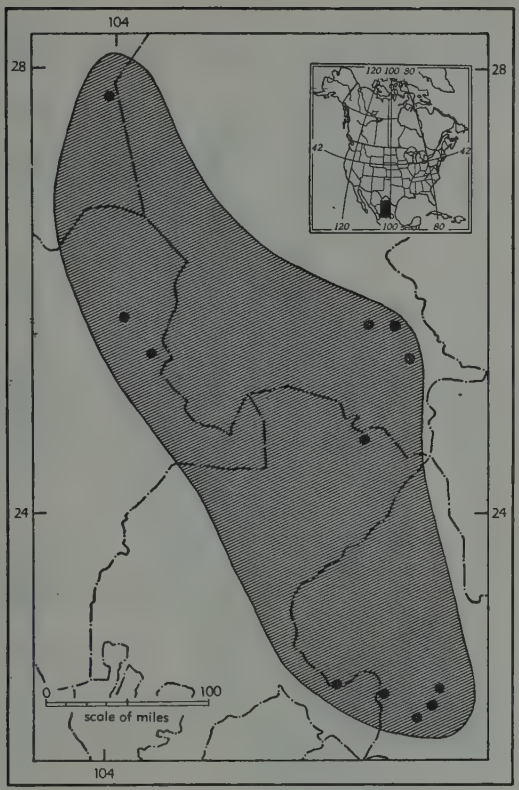
MARGINAL RECORDS.—Arizona: type locality; Walnut (Goldman, 1910:81); Zuni River (*ibid.*). New Mexico (V. Bailey, 1932:188): Grants; Burley; Burro Mts.

Neotoma goldmani Merriam
Goldman's Wood Rat

1903. *Neotoma goldmani* Merriam, Proc. Biol. Soc. Washington, 16:48, March 19, type from Saltillo, 5000 ft., Coahuila.

Average measurements of 4 topotypes are: total length, 279; tail, 128; hind foot, 30. Upper parts creamy buff, paler on head, darkened on back by admixture of dusky hairs; underparts white; feet white; tail blackish above, white below. Skulls resembling those of *N. lepida* and *N. stephensi* but smaller; premaxillary tongues broader posteriorly; audital bullae relatively small; molars relatively large.

MARGINAL RECORDS (Rainey and Baker, 1955:623–624).—Chihuahua: Sierra Almagre, 6000 ft., 12 mi. S Jaco. Coahuila: Jaral; 17 mi. N, 8 mi. W Saltillo, 5200 ft.; type locality. Zacatecas: Concepción del Oro, 7680 ft. San Luis Potosí: Ventura; 10 mi. NE San Luis Potosí; San Luis Potosí; Santa Teresa; Cerro Peñón Blanco. Durango: 4 mi. WSW Lerdo, 3800 ft.; 1 mi. SSE Mapimí, 4100 ft.



Map 392. *Neotoma goldmani.*

mexicana-group
Neotoma mexicana
Mexican Wood Rat

Arranged according to Hall, Jour. Washington Acad. Sci., 45:328–332, October 31, 1955.

External measurements: 290–417; 105–206; 31–41. Upper parts, depending on subspecies, grayish, grayish buff, dull brown, russet or bright rufous, usually darkened dorsally by admixture of blackish hairs; underparts, depending on subspecies, white or yellowish, hairs plumbeous basally except that inguinal and gular hair of many subspecies is white to base; tail black to dusky above, grayish to whitish below. Skull of average size for the genus; anterointernal re-entrant angle of M1 deep, extending more than half way across crown; interorbital region much constricted.

The combination of size, color, and deep anterointernal angle of M1 serves to distinguish this large and variable species from its congeners. Asdell (1946:242) records 2–4 young as the litter size.

Neotoma mexicana atrata Burt

1939. *Neotoma mexicana atrata* Burt, Occas. Papers Mus. Zool., Univ. Michigan, 400:1, March 1, type from 4 mi. W Carrizozo, Lincoln Co., New Mexico. Known only from the type locality.

Neotoma mexicana bullata Merriam

1894. *Neotoma mexicana bullata* Merriam, Proc. Biol. Soc. Washington, 9:122, July 2, type from Santa Catalina Mts., Pima Co., Arizona. Known only from the type locality.

Neotoma mexicana chamula Goldman

1909. *Neotoma ferruginea chamula* Goldman, Proc. Biol. Soc. Washington, 22:141, June 25, type from mountains near San Cristóbal, 8400 ft., Chiapas.
1955. *Neotoma mexicana chamula,* Hall, Jour. Washington Acad. Sci., 45:329, October 31.

MARGINAL RECORDS.—Chiapas: type locality. Guatemala: Hda. Chancol, about 13 mi. N Huehuetenango (Goldman, 1910:69); Volcán Santa María (Goodwin, 1934:54).

Neotoma mexicana distincta Bangs

1903. *Neotoma distincta* Bangs, Proc. Biol. Soc. Washington, 16:89, June 25, type from Texolo [= Teocelo, near Jalapa], Veracruz. Known only from the type locality.
1955. *Neotoma mexicana distincta,* Hall, Jour. Washington Acad. Sci., 45:329, October 31.

Neotoma mexicana eremita Hall

1955. *Neotoma mexicana eremita* Hall, Jour. Washington Acad. Sci., 45:328, October 31, type from 1 mi. S San Francisco, 50 ft., Nayarit. Known only from the type locality.

Neotoma mexicana fallax Merriam

1894. *Neotoma fallax* Merriam, Proc. Biol. Soc. Washington, 9:123, July 2, type from Gold Hill, Boulder Co., Colorado.
1910. *Neotoma mexicana fallax,* Goldman, N. Amer. Fauna, 31:56, October 19.

MARGINAL RECORDS (Goldman, 1910:57–58, unless otherwise noted).—Colorado: 5 mi. SW Fort Collins; 3¾ mi. W Loveland, 5030 ft. (26762 KU); Colorado Springs. New Mexico: Coyote Creek, 8 mi. N Guadalupita; Santa Rosa; Capitan Mts.; 1 mi. S Ruidoso, 6500 ft. (35183 KU); E side Sierra Blanca Mts. (Dice, 1942:206); Manzano Mts. (V. Bailey, 1932:183); San Mateo Peak; Datil Mts. (V. Bailey, 1932:184); Grant; 18 mi. N, 1 mi. E Farmington, 6000 ft. (34817 KU). Colorado: Cortez (Cary, 1911:117); 4 mi. W, 2 mi. S Cahone, 7000 ft. (34792 KU); Bedrock (Warren, 1942:214); 1 mi. SW Gateway, 4600 ft. (34773 KU); 2¾ mi. S Fruita, 4600 ft. (34772 KU); Salida (Cary, 1911:117); type locality.

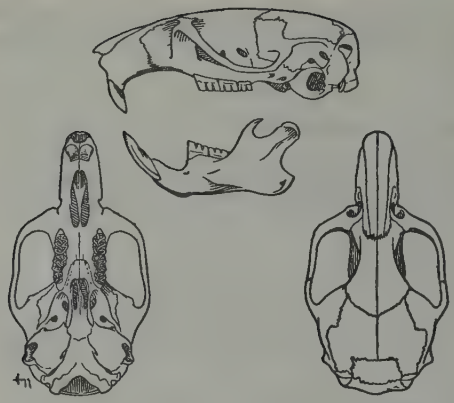


Fig. 384. *Neotoma mexicana fallax*, 1½ mi. NW Golden, Jefferson Co., Colorado, No. 29182 K.U., ♂, X 1.

Neotoma mexicana ferruginea Tomes

1862. *Neotoma ferruginea* Tomes, Proc. Zool. Soc. London, for 1861, p. 282, April, type from Dueñas, Sacatepequez, Guatemala.
1955. *Neotoma mexicana ferruginea*, Hall, Jour. Washington Acad. Sci., 45:329, October 31.

MARGINAL RECORDS.—Guatemala: San Lucas (Goodwin, 1934:54); type locality.

Neotoma mexicana griseoventer Dalquest

1951. *Neotoma ferruginea griseoventer* Dalquest, Jour. Washington Acad. Sci., 41:363, November 14, type from Xilitla, San Luis Potosí.
1955. *Neotoma mexicana griseoventer*, Hall, Jour. Washington Acad. Sci., 45:330, October 31.

MARGINAL RECORDS.—San Luis Potosí: El Salto (Dalquest, 1951:363); type locality.

Neotoma mexicana inopinata Goldman

1933. *Neotoma mexicana inopinata* Goldman, Jour. Washington Acad. Sci., 23:471, October 15, type from Chuska Mts., 8800 ft., San Juan Co., New Mexico.

MARGINAL RECORDS.—Utah: mouth Nigger Bill Canyon, E side Colorado River, 4 mi. above Moab Bridge, 3995 ft. (Durrant, 1952:337). Colorado: Ashbaugh Ranch (Goldman, 1933:472). New Mexico: Gallup (Goldman, 1933:472); Zuñi Mts. (*ibid.*). Arizona: Canyon del Muerto and head Spruce Creek, 9000 ft., Tunitcha Mts. (*ibid.*). Utah: War God Spring, Navajo Mtn. (Durrant, 1952:337).

Neotoma mexicana inornata Goldman

1938. *Neotoma mexicana inornata* Goldman, Proc. Biol. Soc. Washington, 51:60, March 18, type from Carmen Mts., 6100 ft., Coahuila.

MARGINAL RECORDS (Baker, 1956:284).—Coahuila: type locality; *Sierra de la Madera, 22 mi. S, 5 mi. W Ocampo, 6200 ft.*

Neotoma mexicana isthmica Goldman

1904. *Neotoma isthmica* Goldman, Proc. Biol. Soc. Washington, 17:80, March 21, type from Huilotepec, 100 ft., 8 mi. S Tehuantepec, Oaxaca.
1955. *Neotoma mexicana isthmica*, Hall, Jour. Washington Acad. Sci., 45:330, October 31.

MARGINAL RECORDS (Goldman, 1910:72).—Oaxaca: Coixtlahuaca. Chiapas: Teopisca; Canjob. Oaxaca: Juchitán; Puerto Angel; Oaxaca.

Neotoma mexicana madrensis Goldman

1905. *Neotoma mexicana madrensis* Goldman, Proc. Biol. Soc. Washington, 18:31, February 2, type from Sierra Madre, 7000 ft., near Guadalupe y Calvo, Chihuahua.

MARGINAL RECORDS (Goldman, 1910:60, unless otherwise noted).—Chihuahua: Colonia García; Pacheco; near Parral. Zacatecas: 4 mi. E Calabazal (Hooper, 1955: 22); Sierra de Valparaíso. Durango: El Salto; ¼ mi. S Revolcaderos (Hooper, 1955:22); 1½ mi. W San Luis (*ibid.*). Chihuahua: type locality; Carimechi (Burt and Hooper, 1941:7).

Neotoma mexicana mexicana Baird

1855. *Neotoma mexicana* Baird, Proc. Acad. Nat. Sci. Philadelphia, 7:333, April, type from [mountains] near Chihuahua, Chihuahua.

MARGINAL RECORDS (Goldman, 1910:56, unless otherwise noted).—Arizona: Rincon Mts.; Cave Creek, Chiricahua Mts., 6200 ft. (Cahalane, 1939:435). New Mexico: Animas Mts. (*ibid.*); Guadalupe Mts. (V. Bailey, 1932:182). Texas: Fort Davis; Paisano. Chihuahua: Santa Eulalia. Durango: La Ciénega de las Vacas. Sonora (Burt, 1938:65): Cuchita; Oposura.

Neotoma mexicana navus Merriam

1903. *Neotoma navus* Merriam, Proc. Biol. Soc. Washington, 16:47, March 19, type from Sierra Guadalupe, Coahuila.
1955. *Neotoma mexicana navus*, Hall, Jour. Washington Acad. Sci., 45:330, October 31.

MARGINAL RECORDS.—Coahuila: type locality; Diamante Pass, 8500 ft., Sierra Guadalupe, 18 mi. E, 3 mi. N Saltillo (36346 KU).

Neotoma mexicana ochracea Goldman

1905. *Neotoma ferruginea ochracea* Goldman, Proc. Biol. Soc. Washington, 18:30, February 2, type from Atemajac, 4000 ft., near Guadalajara, Jalisco. Known only from the type locality.
1955. *Neotoma mexicana ochracea*, Hall, Jour. Washington Acad. Sci., 45:330, October 31.

Neotoma mexicana parvidens Goldman

1904. *Neotoma parvidens* Goldman, Proc. Biol. Soc. Washington, 17:81, March 21, type from Juquila, 5000 ft., Oaxaca.
1955. *Neotoma mexicana parvidens*, Hall, Jour. Washington Acad. Sci., 45:330, October 31.

Map 393. *Neotoma mexicana* and allied species.

1. *N. mexicana atrata*
2. *N. mexicana bullata*
3. *N. mexicana chamula*
4. *N. mexicana distincta*
5. *N. mexicana eremita*
6. *N. mexicana fallax*
7. *N. mexicana ferruginea*
8. *N. mexicana griseoventer*
9. *N. mexicana inopinata*
10. *N. mexicana inornata*
11. *N. mexicana isthmica*
12. *N. mexicana madrensis*
13. *N. mexicana mexicana*
14. *N. mexicana navus*
15. *N. mexicana ochracea*
16. *N. mexicana parvidens*
17. *N. mexicana picta*
18. *N. mexicana pinetorum*
19. *N. mexicana scopulorum*
20. *N. mexicana sinaloae*
21. *N. mexicana solitaria*
22. *N. mexicana tenuicauda*
23. *N. mexicana torquata*
24. *N. mexicana tropicalis*
25. *N. mexicana vulcani*
26. *N. chrysomelas*
27. *N. angustipalata*

MARGINAL RECORDS.—Oaxaca: type locality; 1 mi. NNW Soledad [approx. 30 km. N Punta Angel], 4700 ft. (63079 KU).

Neotoma mexicana picta Goldman

1904. *Neotoma picta* Goldman, Proc. Biol. Soc. Washington, 17:79, March 21, type from mountains near Chilpancingo, 10,000 ft., Guerrero.
1955. *Neotoma mexicana picta,* Hall, Jour. Washington Acad. Sci., 45:331, October 31.

MARGINAL RECORDS (Goldman, 1910:73).—Guerrero: Omilteme; type locality. Oaxaca: mountains near Ozolotepec.

Neotoma mexicana pinetorum Merriam

1893. *Neotoma pinetorum* Merriam, Proc. Biol. Soc. Washington, 8:111, July 31, type from San Francisco Mtn., Coconino Co., Arizona.
1910. *Neotoma mexicana pinetorum,* Goldman, N. Amer. Fauna, 31:58, October 19.

MARGINAL RECORDS (Goldman, 1910:59, unless otherwise noted).—Arizona: S rim Grand Canyon (V. Bailey, 1935:16); type locality; Winona (226370 BS). New Mexico: 10 mi. SW Quemado; 10 mi. W Chloride; Kingston. Arizona: Prieto Plateau (205483 BS); Bradshaw Mts. (215809 BS); Simmons (215529 BS); Pine Spring (202570 BS).

Neotoma mexicana scopulorum Finley

1953. *Neotoma mexicana scopulorum* Finley, Univ. Kansas Publ., Mus. Nat. Hist., 5:529, August 15, type from 3 mi. NW Higbee, 4300 ft., Otero Co., Colorado.

MARGINAL RECORDS (Finley, 1953:534).—Colorado: type locality; Two Buttes [the peak], 4600–4650 ft. Oklahoma: Tesequite Canyon. New Mexico: Clayton; Sierra Grande; Oak Cañon, Raton Range. Colorado: Trinidad; 20 mi. E Walsenburg.

Neotoma mexicana sinaloae J. A. Allen

1898. *Neotoma sinaloae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:149, April 12, type from Tatámeles, Sinaloa.
1910. *Neotoma mexicana sinaloae,* Goldman, N. Amer. Fauna, 31:60, October 19.

MARGINAL RECORDS.—Sonora (Burt, 1938:65): San Javier; Mira Sol. Durango: Chacala (Goldman, 1910:61). Sinaloa: Chele (Hooper, 1955:22); Mazatlán (Goldman, 1910:61). Sonora: Camoa (Burt, 1938:65).

Neotoma mexicana solitaria Goldman

1905. *Neotoma ferruginea solitaria* Goldman, Proc. Biol. Soc. Washington, 18:31, February 2, type from Nentón, 3500 ft., Guatemala.
1955. *Neotoma mexicana solitaria,* Hall, Jour. Washington Acad. Sci., 45:331, October 31.

MARGINAL RECORDS.—Guatemala: type locality; Sacapulas (Goodwin, 1942:170–171). Honduras: Cerro Puca (*ibid.*).

Neotoma mexicana tenuicauda Merriam

1892. *Neotoma tenuicauda* Merriam, Proc. Biol. Soc. Washington, 7:169, September 29, type from north slope Sierra Nevada de Colima, 12,000 ft., Jalisco.
1955. *Neotoma mexicana tenuicauda,* Hooper, Occas. Papers Mus. Zool., Univ. Michigan, 565:22, March 31.

MARGINAL RECORDS (Goldman, 1910:74, unless otherwise noted).—Jalisco: mountains about 10 mi. N Bolaños. Zacatecas: Plateado. Aguascalientes: Sierra Fría (Hooper, 1955:22). Jalisco: 2 mi. NNW Magdalena (*ibid.*). Michoacán: Zamora; 9 mi. SE Pátzcuaro, 8000 ft. (Hall and Villa, 1949:467); Tancítaro, 7850 ft. (*ibid.*). Jalisco: type locality; Talpa; San Sebastián.

Neotoma mexicana torquata Ward

1891. *Neotoma torquata* Ward, Amer. Nat., 25:160, February, type from abandoned mine between Tetela del Volcán and Zacualpan, Morelos.
1955. *Neotoma mexicana torquata,* Hall, Jour. Washington Acad. Sci., 45:331, October 31.
1894. *Neotoma fulviventer* Merriam, Proc. Biol. Soc. Washington, 9:121, July 2, type from Toluca Valley, México.
1894. *Neotoma orizabae* Merriam, Proc. Biol. Soc. Washington, 9:122, July 2, type from Volcán de Orizaba, Puebla.

MARGINAL RECORDS.—Hidalgo: Encarnación (Goldman, 1910:64). Veracruz: 3 km. E Las Vigas, 8000 ft. (19840 KU). Puebla: Tehuacán, 1700 m. (Hooper, 1947: 55). Morelos: 2 km. S Jonacatepec (Davis and Russell, 1954:77). México: N slope Volcán Toluca (Goldman, 1910:64).

Neotoma mexicana tropicalis Goldman

1904. *Neotoma tropicalis* Goldman, Proc. Biol. Soc. Washington, 17:81, March 21, type from Totontepec, 6500 ft., Oaxaca. Known only from the type locality.
1955. *Neotoma mexicanus tropicalis,* Hall, Jour. Washington Acad. Sci., 45:331, October 31.

Neotoma mexicana vulcani Sanborn

1935. *Neotoma ferruginea vulcani* Sanborn, Field Mus. Nat. Hist., Publ. 340, Zool. Ser., 20(11):84, May 15, type from south slope Volcán Tajumulco, San Marcos, 13,200 ft., Guatemala. Known only from the type locality.
1955. *Neotoma mexicana vulcani,* Hall, Jour. Washington Acad. Sci., 45:332, October 31.

Neotoma chrysomelas J. A. Allen
Nicaraguan Wood Rat

1908. *Neotoma chrysomelas* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:653, October 13, type from Matagalpa, Matagalpa, Nicaragua.

Average external measurements of 4 topotypes are: 375; 160; 36. "Upper parts light orange rufous . . . , purest along sides, darkened on top of head and back by overlying black-tipped hairs; . . . underparts white, the fur plumbeous basally except small areas, mainly on throat and on pectoral and inguinal regions, where it is pure white to roots;

. . . tail brownish or blackish above, grayish below" (Goldman, 1910:75). Compared with the skull of *N. m. chamula*, that of *chrysomelas* "has zygomata more squarely spreading posteriorly, narrowing anteriorly, the sides less nearly parallel than in *chamula*; squamosal arm of zygoma heavier; frontals broader posteriorly, the lateral border slightly convex and overhanging orbits" (Goldman, *loc. cit.*).

MARGINAL RECORDS.—Honduras (Goodwin, 1942: 171): Montana Vasquez; Hatillo. Nicaragua: type locality.

Neotoma angustapalata Baker
Tamaulipan Wood Rat

1951. *Neotoma angustapalata* Baker, Univ. Kansas Publ., Mus. Nat. Hist., 5:217, December 15, type from 70 km. by highway S Ciudad Victoria, 6 km. W Panamerican highway at El Carrizo, Tamaulipas.

External measurements of a male topotype are: 380; 195; 42. Upper parts dusky brown; head, especially cheeks, grayer; underparts plumbeous washed with white, entirely white on gular and inguinal regions; tail sparsely haired, blackish above, whitish below. Skull with large audital bullae; external auditory meatus large; sides of interpterygoid fossa concave and broadly excavated near posterior end of tooth-row; anterointernal re-entrant angle of M1 deep.

Hooper (1953:10) suggests that the specimens upon which this species was described, and assigned by its author to the *mexicana*-group, are instead "large, deeply pigmented examples of the species *N. micropus*. . . ." The form of the baculum of *N. angustapalata*, however, suggests no close affinities with *N. micropus* or *mexicana*; indeed, the baculum is indistinguishable from that of *N. albigula* figured by Burt and Barkalow (1942:291).

MARGINAL RECORDS.—Tamaulipas: Rancho del Cielo (Hooper, 1953:9); near El Pachón (*ibid.*); type locality.

fuscipes-group
Neotoma fuscipes
Dusky-footed Wood Rat

External measurements: 335–468; 158–241; 32–47. Upper parts ochraceous buff, darkened dorsally by dusky hairs, usually much grayer on face; underparts white, sometimes washed with tawny or pale buff, hairs plumbeous basally except on throat, chest, and inguinal region where hairs are white to roots; feet and ankles usually dusky, sometimes white distally; tail dark above sometimes lighter below but not sharply bicolored. Skull large, long, relatively narrow; premaxillary tongues long; faint to moderate supraorbital ridge present; interpterygoid fossa usually narrow, or variable in shape anteriorly; audital bullae large; maxillary tooth-row slightly narrower posteriorly than anteriorly; M3 broad, the middle enamel loop partially or wholly divided by deep inner re-entrant angle.

Principally because of the structure of the molar tooth-row, this species-group was once accorded subgeneric rank (subgenus *Homodontomys*), but is regarded by Burt and Barkalow (1942:290) as better placed in the subgenus *Neotoma*.

The large cone-shaped stick houses of this big rat are conspicuous and are either on the ground or in the lower branches of trees. Some houses are as much as 12 feet in diameter and 6 feet high.

Reproductive habits vary somewhat within the species, probably because of the wide latitudinal distribution. The gestation period is 33 days. Two to 4 young, usually 2 or 3, comprise a litter.

Neotoma fuscipes annectens Elliot

1898. *Neotoma fuscipes annectens* Elliot, Field Columb. Mus., Publ. 27, Zool. Ser., 1(10):201, April 16, type from Portola, San Mateo Co., California.
1898. *Neotoma fuscipes affinis* Elliot, Field Columb. Mus., Publ. 27, Zool Ser., 1(10):202, April 16, type from Alum Rock Park, Santa Clara Co., California.

MARGINAL RECORDS.—California (Hooper, 1938: 223): W side Mt. Diablo, 1750 ft.; Strawberry Canyon, 200–500 ft., thence along coast to point of beginning.

Neotoma fuscipes bullatior Hooper

1938. *Neotoma fuscipes bullatior* Hooper, Univ. California Publ. Zool., 42:225, March 1, type from 2 mi. S San Miguel, 620 ft., San Luis Obispo Co., California.

MARGINAL RECORDS (Hooper, 1938:226).—California: type locality; Carrizo Plains; San Diego Joe's, 16 mi. SW McKittrick.

Neotoma fuscipes fuscipes Baird

1858. *Neotoma fuscipes* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):495, July 14, type from Petaluma, Sonoma Co., California.
1894. *Neotoma splendens* True, Diagnoses of some undescribed wood rats (genus *Neotoma*) in the National Museum, p. 1, June 27 (preprint of Proc. U.S. Nat. Mus., 17:353, November 15, 1894), type from Nicasio, Marin Co., California.

MARGINAL RECORDS (Hooper, 1938:221–222).—California: Seiad Valley, 1400 ft.; Crescent Butte, approximately 4500 ft., Lava Beds National Monument; McCloud River near Baird Station; 5 mi. W Fruto, 700 ft.; Sites; Rumsey, 500 ft.; 3 mi. W Vacaville, 700 ft.; near Petaluma; K3 Lodge, Stubbs; Horse Ridge, near Ruth; Caves, 11 mi. NE Weed, 3600 ft.

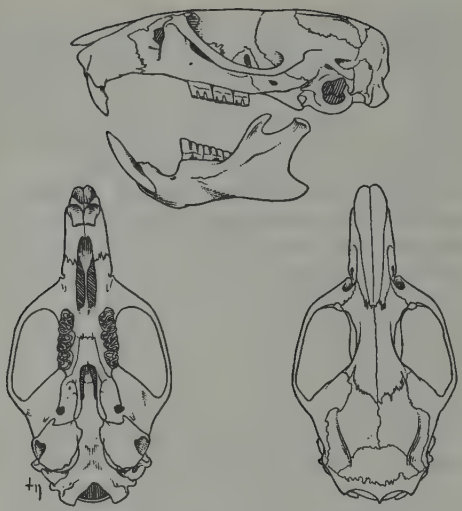


Fig. 385. *Neotoma fuscipes monochroura*, Van Duzen River, 5 mi. E Carlotta, Humboldt Co., California, No. 47261 K.U., ♂, X 1.

Neotoma fuscipes luciana Hooper

1938. *Neotoma fuscipes luciana* Hooper, Univ. California Publ. Zool., 42:229, March 1, type from Seaside, Monterey Co., California.

MARGINAL RECORDS (Hooper, 1938:230).—California: Camp Ord, 3½ mi. E Marina, 100 ft.; San Lucas; Salinas Valley, San Ardo, 450 ft.; Paso Robles, 750 ft.; 1 mi. NE Morro, thence along coast to point of beginning.

Neotoma fuscipes macrotis Thomas

1893. *Neotoma macrotis* Thomas, Ann. Mag. Nat. Hist., ser. 6, 12:234, September, type from San Diego, San Diego Co., California.
1894. *Neotoma fuscipes macrotis*, Merriam, Proc. Acad. Nat. Sci., Philadelphia, 14:246, September 25.

MARGINAL RECORDS (Hooper, 1938:232).—California: Santa Margarita, 996 ft.; Matilija; 7 mi. S Simi; Arroyo Seco, near Pasadena; Glendora; 2 mi. NE Grapeland, 2000 ft.; base San Jacinto Mts., 1700 ft., near Cabezon; Garnet Queen Mine, Santa Rosa Mts. Baja California: Sierra Juárez; 5 mi. S Monument 258, W coast, thence northward along the coast to opposite the point of beginning.

Neotoma fuscipes martirensis Orr

1934. *Neotoma fuscipes martirensis* Orr, Proc. Biol. Soc. Washington, 47:110, June 13, type from Valladares, 2700 ft., Sierra San Pedro Mártir, Baja California.

MARGINAL RECORDS (Hooper, 1938:233, unless otherwise noted).—Baja California: Ensenada (Goldman, 1910:94; on geographic grounds *fide* Hooper, 1938:218); Las Cruces, 20 mi. E Ensenada, 2600 ft.; Laguna Hanson, 5200 ft; Concepción, 6000 ft.; Vallecitos, 8500 ft., Sierra San Pedro Mártir; 1 mi. E El Rosario, 200 ft.

Map 394. *Neotoma fuscipes*.

Guide to subspecies
1. *N. f. annectens*
2. *N. f. bullatior*
3. *N. f. fuscipes*
4. *N. f. luciana*
5. *N. f. macrotis*
6. *N. f. martirensis*
7. *N. f. monochroura*
8. *N. f. perplexa*
9. *N. f. riparia*
10. *N. f. simplex*
11. *N. f. streatori*

Neotoma fuscipes monochroura Rhoads

1894. *Neotoma monochroura* Rhoads, Amer. Nat., 28:67, January, type from Grants Pass, Josephine Co., Oregon.
1906. *Neotoma fuscipes monochroura*, Stephens, California mammals, p. 116.

MARGINAL RECORDS (Hooper, 1938:220, unless otherwise noted).—Oregon: Salem; Prospect; Belmont Orchard, 6 mi. S Medford. California: E Fork Illinois River, ¼ mi. S Oregon line, 1900 ft.; Fair Oaks; 3 mi. S Covelo; 6 mi. N Willits, 1400 ft.; Lake Leonard, 10 mi. NW Ukiah; 1 mi. W Guerneville; Freestone, 300 ft.; Nicasio, thence along coast to Oregon: Gold Beach (Goldman, 1910:89); Drain; vicinity Corvallis (Walters and Roth, 1950:290).

Neotoma fuscipes perplexa Hooper

1938. *Neotoma fuscipes perplexa* Hooper, Univ. California Publ. Zool., 42:224, March 1, type from Sweeney's Ranch, 22 mi. S Los Banos, Merced Co., California.

MARGINAL RECORDS (Hooper, 1938:225, unless otherwise noted).—California: Pacheco Pass (Kelson, 1952: 237); type locality; 2 mi. NNE New Idria, 1900 ft.; Arroyo Pasajero, 5 mi. E Coalinga; Priest Valley, 2400–2500 ft.; 1½ mi. S Soledad, 182 ft.

Neotoma fuscipes riparia Hooper

1938. *Neotoma fuscipes riparia* Hooper, Univ. California Publ. Zool., 42:223, March 1, type from Kincaid's Ranch, 2 mi. NE Vernalis, Stanislaus Co., California.

MARGINAL RECORDS.—California: San Joaquin River, 3 mi. NE Vernalis (Hooper, 1938:224); El Nido (Goldman, 1910:94; referred on geographic grounds).

Neotoma fuscipes simplex True

1894. *Neotoma macrotis simplex* True, Diagnoses of some undescribed wood rats (genus *Neotoma*) in the National Museum, p. 2, June 27 (preprint of Proc. U.S. Nat. Mus., 17:354, November 15, 1894), type from Fort Tejon, Kern Co., California.
1901. *Neotoma fuscipes simplex*, Miller and Rehn, Proc. Boston Soc. Nat. Hist., 30(1):105, December 27.
1894. *Neotoma fuscipes dispar* Merriam, Proc. Biol. Soc. Washington, 9:124, July 2, type from Lone Pine, Inyo Co., California.
1904. *Neotoma fuscipes mohavensis* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):246, January 7, type from Oro Grande, San Bernardino Co., California.
1904. *Neotoma fuscipes cnemophila* Elliot, Field Columb. Mus., Publ. 90, Zool. Ser., 3:267, March, type from Lockwood Valley, Mt. Piños, Ventura Co., California.

MARGINAL RECORDS.—California (Hooper, 1938:228–229): Kearsarge Pass, 6000 ft., Sierra Nevada; Carl Walter's Ranch, 2 mi. N Independence; Onyx, 2750 ft.; Oro Grande, 2700 ft.; Doble, 7000 ft.; Seven Oaks, 5000–5100 ft.; Fairmont; 10 mi. W Lebec; Mt. Piños, 5500–6500 ft.; Buena Vista Lake, N side; head of Cuddy Valley, 5900 ft.

Neotoma fuscipes streatori Merriam

1894. *Neotoma fuscipes streatori* Merriam, Proc. Biol. Soc. Washington, 9:124, July 2, type from Carbondale, Amador Co., California.

MARGINAL RECORDS (Hooper, 1938:227).—California: Manton, 2300 ft.; Lyman's, 3300 ft., 4 mi. NW Lyonsville; Blue Canyon, 4600 ft.; Michigan Bluff, 3500 ft.; Cascades, Yosemite National Park; Kings River Canyon, 5000 ft.; Canyon Creek, 700 ft., 7 mi. W Orosi; 3 mi. SE Friant; Raymond, 740 ft.; 3 mi. NE Coulterville, 3200 ft.; type locality; 1 mi. NE Red Bluff, 300 ft.

Subgenus **Teonoma** Gray

1843. *Teonoma* Gray, List of the . . . Mammalia in the . . . British Museum, p. 117. Type, *Myoxus drummondii* Richardson.

"Tail large, bushy, and somewhat distichous; sole of hind foot normally densely furred from heel to posterior tubercle. Skull large and angular; temporal ridges prominent, diverging posteriorly to near anterior border of interparietal, whence they turn abruptly inward and again outward in crossing interparietal to lambdoidal crest; frontal region narrow, constricted near middle, somewhat depressed, and excavated above along median line; maxillary arms of zygomata broad and heavy; bullae large; interpterygoid fossa narrow" (Goldman, 1910:95).

There is only one species, *N. cinerea*, in the subgenus.

Neotoma cinerea
Bushy-tailed Wood Rat

External measurements: 292–470; 120–223; 33–52. Upper parts varying from pale gray lightly washed with buff to dark brownish black; underparts varying from white to pinkish or buff; tail dusky above, much paler (usually whitish) below. Skull with relatively short braincase; anterior palatine foramina longer than palatal bridge; sphenopalatine vacuities present or absent, but relatively constant within a series; M1 with deep anterointernal reentrant angle; M3 with anterior closed triangle and two confluent posterior loops.

This is the only species of the genus that has a bushy, somewhat squirrellike tail.

Bushy-tailed wood rats are essentially boreal animals and are mostly found at higher altitudes or higher latitudes. They are, in fact, sometimes called mountain pack rats. The stick house usually is situated in a crevice in ledge-rock or in an abandoned cabin or mine-shaft. The nest itself is either a globular mass or a cup-shaped affair of shredded bark, dry grass, moss, leaves, or any other available soft material.

Little is known of the breeding habits of this species. Hall (1946:535) reports 3–5 embryos in Nevadan specimens.

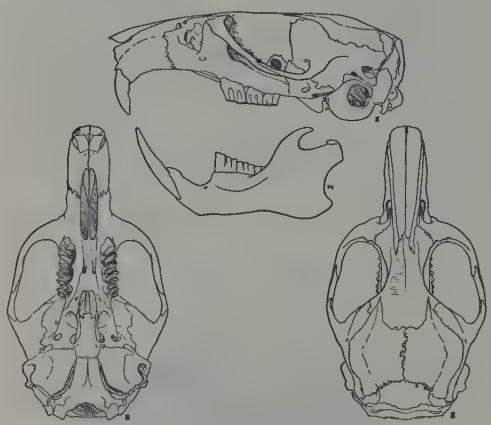


Fig. 386. *Neotoma cinerea acraia,* Baker Creek, 8500 ft., Nevada, No. 41994, M.V.Z., ♀, X 1.

Neotoma cinerea acraia (Elliot)

1904. *Teonoma cinerea acraia* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):247, January 7, type from Jordan Hot Springs, near Kern River, Sierra Nevada, Tulare Co., California.

1940. *Neotoma cinerea acraia,* Hooper, Univ. California Publ. Zool., 42:413, May 17.

MARGINAL RECORDS.—Idaho: E side Bear Lake (Kelson, 1952:240). Utah (Durrant, 1952:348): Stockmore; Fish Lake Plateau; Henry Mts. Arizona: Bright Angel Springs, Kaibab Plateau (Kelson, 1952:240). Utah: Cottonwood [Wash], 8 mi. N Kanab, 4800 ft. (Durrant, 1952: 348). Nevada (Hall, 1946:538): Hidden Forest; 11 mi. E Panaca, 6700 ft.; Water Canyon, 8 mi. N Lund; Monitor Valley, 9 mi. E Toquima Peak, 7000 ft.; Lapon Canyon, Mt. Grant, 8900 ft. California: Hanaupah Canyon, 8900–9500 ft., Panamint Mts. (Hooper, 1940:415); type locality; Fresno (Hubbard, 1939:375). Nevada (Hall, 1946:538): 2 mi. S Zephyr Cove; Carson City; 5 mi. W Fallon; Cherry Creek, 6800 ft.; Goose Creek, 2 mi. W Utah boundary, 5000 ft. Utah: Standrod, Raft River Mts., 5500 ft. (Durrant, 1952:348).

Neotoma cinerea alticola Hooper

1940. *Neotoma cinerea alticola* Hooper, Univ. California Publ. Zool., 42:409, May 17, type from Parker Creek [= Shields Creek, U.S. Forest Service map, 1932 edition], 5500 ft., Warner Mts., Modoc Co., California.

MARGINAL RECORDS.—Washington: Stay-a-while Spring (Dalquest, 1948:336). Idaho: John Day Ranch, 10 mi. SW White Bird (Hooper, 1940:410); Arco (Kelson, 1952:239); N side, South Fork, Snake River, 3 mi. W Swan Valley (Hooper, 1940:410); [Schutt's Mine] vicinity of Pocatello (*ibid.*). Utah: Grouse Creek, 6000 ft. (Durrant, 1952:346). Nevada (Hall, 1946:536): Steels Creek, 7000 ft.; Willow Creek, Ruby Mts., 2 mi. S Elko Co. line, 6500 ft.; Evans. California (Hooper, 1940:410–411): ½ mi. N Tahoe City; Lake Helen, 8500 ft. Oregon (Kelson, 1952: 238–239): Tule Lake; Bend; near mouth John Day River.

Neotoma cinerea arizonae Merriam

1893. *Neotoma arizonae* Merriam, Proc. Biol. Soc. Washington, 8:110, July 31, type from Keams Canyon, Navajo Co., Arizona.

1910. *Neotoma cinerea arizonae,* Goldman, N. Amer. Fauna, 31:106, October 19.

MARGINAL RECORDS.—Utah: Castle Valley, 18 mi. NE Moab, 6000 ft. (Durrant, 1952:352). Colorado: Bedrock (Cary, 1911:113); Coventry (*ibid.*); 1 mi. E, 7 mi. N Hermosa, 8100 ft. (34832 KU). New Mexico (V. Bailey, 1932:191): Farmington; Pueblo Bonito, Chaco Canyon. Arizona: Holbrook (Goldman, 1910:106; Winslow (*ibid.*); Walpai [*sic*] (V. Bailey, 1935:15); Lees Ferry (*ibid.*).

Neotoma cinerea cinerea (Ord)

1815. *Mus cinereus* Ord, *in* Guthrie, A new geogr., hist., comm. grammar . . . , Philadelphia, 2nd Amer. ed., 2:292. Type locality, near Great Falls, Cascade Co., Montana.

1858. *Neotoma cinerea,* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):499, July 14.

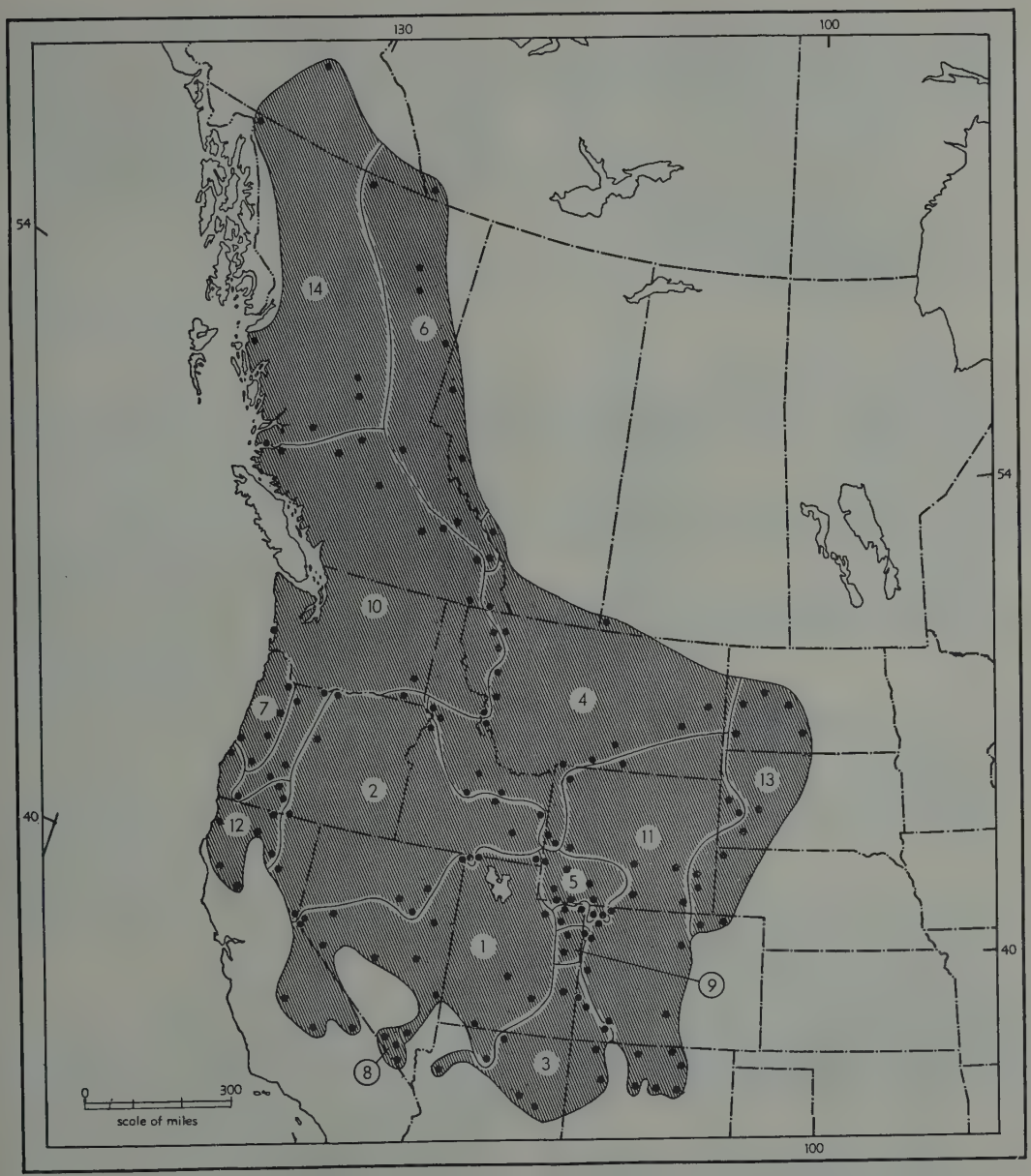
MARGINAL RECORDS (Goldman, 1910:98, unless otherwise noted).—Alberta: Banff National Park (Anderson, 1947:143). Saskatchewan: Govenlock (Nero, 1956: 43). Montana: Terry; Miles City; Billings; Red Lodge; Gardiner. Wyoming: 3 mi. W Stanley (176908 BS); Salt River, 10 mi. N Afton, 6200 ft. (176977 BS). Idaho: Lost River Mts., near Arco (Kelson, 1952:239); Challis (Davis, 1939:301); Sawtooth (*ibid.*); Riggins (*ibid.*); Fiddle Creek (*ibid.*). Montana: Rock Creek; Bass Creek; Ravalli; Columbia Falls. British Columbia: Newgate (Anderson, 1947:143).

Neotoma cinerea cinnamomea J. A. Allen

1895. *Neotoma cinnamomea* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:331, November 8, type from Kinney Ranch, Bitter Creek, Sweetwater Co., Wyoming.

1944. *Neotoma cinerea cinnamomea,* Hooper, Jour. Mamm., 25:415, December 12.

MARGINAL RECORDS (Kelson, 1952:239–240, unless otherwise noted).—Wyoming: Cokeville; Fontenelle; Thayer Junction (Hooper, 1944:415); type locality. Colorado: 8 mi. NE Craig; Douglas Spring (Warren, 1942:221). Wyoming: Green River, 4 mi. E Linwood (Utah); Beaver Creek, 4 mi. S Lonetree; Fort Bridger.



Map 395. *Neotoma cinerea.*

Guide to subspecies
1. *N. c. acraia*
2. *N. c. alticola*
3. *N. c. arizonae*
4. *N. c. cinerea*
5. *N. c. cinnamomea*
6. *N. c. drummondii*
7. *N. c. fusca*
8. *N. c. lucida*
9. *N. c. macrodon*
10. *N. c. occidentalis*
11. *N. c. orolestes*
12. *N. c. pulla*
13. *N. c. rupicola*
14. *N. c. saxamans*

Neotoma cinerea drummondii (Richardson)

1828. *Myoxus drummondii* Richardson, Zool. Jour., 3:517. Type locality, probably near Jasper House, Alberta. (See Goldman, N. Amer. Fauna, 31:99, October 19, 1910.)
1892. *Neotoma cinerea drummondi,* Merriam, Proc. Biol. Soc. Washington, 7:25, April 13.

MARGINAL RECORDS.—Mackenzie: Fort Liard (Goldman, 1910:99). British Columbia: St. John Creek (Cowan, 1939:81). Alberta: Pipestone Creek and Wapiti River (Soper, 1948:59); type locality. British Columbia: *Kootenay Park* (Cowan and Guiguet, 1956:194); Glacier House (Goldman, 1910:99); Paradise Mine (Cowan and Guiguet, 1956:194); Barkerville (*ibid.*); Laurier Pass (Sheldon, 1932:200); Robb Lake (*ibid.*); Fort Halkett (Preble, 1908: 176).

Neotoma cinerea fusca True

1894. *Neotoma occidentalis fusca* True, Diagnoses of some undescribed wood rats (genus *Neotoma*) in the National Museum, p. 2, June 27 (preprint of Proc. U.S. Nat. Mus., 17:354, November 15, 1894), type from Fort Umpqua, Douglas Co., Oregon.
1897. [*Neotoma cinerea*] *fusca,* Trouessart, Catalogus mammalium . . . , fasc. 3, p. 544.
1903. *Neotoma fuscus apicalis* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3:160, May 7, type from Gardiner, Douglas Co., Oregon.

MARGINAL RECORDS.—Oregon: Portland (Hooper, 1940:420); Wells (Goldman, 1910:104); Eugene (Hooper, 1940:419); type locality; Gardiner (Hooper, 1940:421), thence northward along coast and Columbia River to point of beginning.

Neotoma cinerea lucida Goldman

1917. *Neotoma cinerea lucida* Goldman, Proc. Biol. Soc. Washington, 30:111, May 23, type from Charleston Peak, Charleston Mts., Clark Co., Nevada.

MARGINAL RECORDS.—Nevada (Hall, 1946:538): Clark Canyon, 8000 ft.; type locality; N side Potosi Mtn., 7000 ft.

Neotoma cinerea macrodon Kelson

1949. *Neotoma cinerea macrodon* Kelson, Jour. Washington Acad. Sci., 30:417, December 15, type from east side confluence Green and White rivers, 4700 ft., 1 mi. SE Ouray, Uintah Co., Utah.

MARGINAL RECORDS.—Colorado: 11 mi. W, 11 mi. N Rangely, 6000 ft. (29201 KU); *10 mi. W, 5 mi. N Rangely, 5800 ft.* (29202 KU). Utah: Willow Creek, 29 mi. S Ouray, 5400 ft. (Durrant, 1952:351); type locality.

Neotoma cinerea occidentalis Baird

1855. *Neotoma occidentalis* Baird, Proc. Acad. Nat. Sci. Philadelphia, 7:335, April, type from Shoalwater [= Willapa] Bay, Pacific Co., Washington.
1891. *Neotoma cinerea occidentalis,* Merriam, N. Amer. Fauna, 5:58, July 30.
1899. *Neotoma c[inerea], columbiana* Elliot, Field Columb. Mus., Publ. 32, Zool. Ser., 1(13):255, May 17, type from Ducks, British Columbia.

MARGINAL RECORDS (Goldman, 1910:102–103, unless otherwise noted).—British Columbia: Tiltzarone Lake (Cowan and Guiguet, 1956:195); Lac la Hache (*ibid.*); Sicamous; Revelstoke (*ibid.*); Invermere (*ibid.*); Yahk (Anderson, 1947:143). Montana (Hooper, 1940:419): Upper Stillwater Lake, 3500 ft.; Flathead Lake; Gird Creek. Washington: Almota. Oregon: The Dalles (Kelson, 1952: 238–239); Crater Lake (*ibid.*); Prospect; Oregon Caves National Monument (Roest, 1951:348); Bissell. Washington: type locality, thence along coast northward to British Columbia: head of Rivers Inlet (Anderson, 1947:143).

Neotoma cinerea orolestes Merriam

1894. *Neotoma orolestes* Merriam, Proc. Biol. Soc. Washington, 9:128, July 2, type from Saguache Valley, 20 mi. W Saguache, Saguache Co., Colorado.
1910. *Neotoma cinerea orolestes,* Goldman, N. Amer. Fauna, 31:104, October 19.
1894. *Neotoma grangeri* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:324, November 7, type from Custer, Custer Co., South Dakota.

MARGINAL RECORDS (Goldman, 1910:105, unless otherwise noted).—Montana: Pryor Mts. South Dakota: Deadwood; Custer. Wyoming: Laramie Peak; Islay. Colorado: Boulder County; type locality. New Mexico: Costilla Pass; near Cimarron (Hill, 1942:81); junction Pecos and Mora rivers, 8000 ft. (V. Bailey, 1932:189); Willis; Jemez Mts. (V. Bailey, 1932:189); Tierra Amarillo. Colorado: 6¾ mi. SW Silverton, 10,100 ft. (34831 KU); 2¾ mi. S Fruita, 4600 ft. (34838 KU); Rangely. Utah (Durrant, 1952:350): Myton; Granite Park; Hideout. Colorado: Lily; Snake River near Sunny Peak. Wyoming: Bridger Pass; Ferris Mts.; jct. Green River and New Fork; Upper Geyser Basin, Yellowstone National Park (V. Bailey, 1930:101).

Neotoma cinerea pulla Hooper

1940. *Neotoma cinerea pulla* Hooper, Univ. California Publ. Zool., 42:411, May 17, type from Kohnenberger's Ranch, South Fork Mtn., 3200 ft., Trinity Co., California.

MARGINAL RECORDS (Kelson, 1952:238, unless otherwise noted).—Oregon: Empire; Fort Klamath; Naylox. California: Brownell; Burney; Castle Lake, 5434 ft. (Hooper, 1940:412); Elk Creek (*ibid.*); near Blake Lookout, South Fork Mtn., 5500 ft. (*ibid.*); Orick.

Neotoma cinerea rupicola J. A. Allen

1894. *Neotoma rupicola* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:323, November 7, type from Corral Draw, 3700 ft., Pine River Indian Reservation, Black Hills, South Dakota.
1910. *Neotoma cinerea rupicola,* Goldman, N. Amer. Fauna, 31:107, October 19.

MARGINAL RECORDS (V. Bailey, 1927:86–87, unless otherwise noted).—North Dakota: Oakdale; Fort Clark; Cannonball. Colorado (Warren, 1942:220): Avalo; 10 or 15 mi. W Grover. Wyoming: 2½ mi. S Chugwater, 5300 ft. (18390 KU); Uva (Cary, 1911:114). Nebraska: Warbonnet Canyon (Goldman, 1910:107). South Dakota: type locality; Quinns Draw, Cheyenne River (Goldman, 1910: 101). North Dakota: 25 mi. S Medora; Mikkelson.

Neotoma cinerea saxamans Osgood

1900. *Neotoma saxamans* Osgood, N. Amer. Fauna, 19:33, October 6, type from Bennett City, head Lake Bennett, British Columbia.
1903. *Neotoma cinerea saxamans,* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:544, October 10. (Cowan and Guiguet, The mammals of British Columbia, Handbook No. 11, Provincial Mus. of British Columbia, p. 195, regard the name *saxamans* as a synonym of the subspecific name *occidentalis.*)

MARGINAL RECORDS (Goldman, 1910:110, unless otherwise noted).—Yukon: jct. Pelly and Ross rivers (Anderson, 1947:143). British Columbia: Stuart Lake; Nulki Lake (Munro, 1939:130); Stuie (Anderson, 1947:143); River[s] Inlet; Inverness; type locality.

Subgenus **Hodomys** Merriam

1894. *Hodomys* Merriam, Proc. Acad. Nat. Sci. Philadelphia, 46:232, September 24. Type, *Neotoma alleni* Merriam.

Enamel pattern of chewing surface of last lower molar S-shaped rather than having two transverse loops as in other members of the genus; incisive foramina extending to level of tooth-rows; audital bullae small.

Burt and Barkalow (1942:295) consider *Hodomys* to be of only subgeneric rank and write, "we have failed to find characters of sufficient fundamental importance, in our estimation, to warrant full generic rank. The character of the third lower molar seems to be the most important one separating *Hodomys* from *Neotoma.* We find no approach to the general *Neotoma* type of tooth in a series of *Hodomys* at hand, but we do find an occasional approach to the *Hodomys* type of tooth pattern in *Neotoma* skulls."

There is but one known species, *Neotoma alleni,* according to Kelson (1952:240–242).

Neotoma alleni
Allen's Wood Rat

Arranged according to Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:240–242, April 10, 1952.

External measurements: 390–446; 181–224; 40–43. Upper parts rich reddish brown to dusky brown; underparts plumbeous washed with white, sometimes faintly buffy; tail sparsely haired, more or less dusky above and below.

Merriam (1892:169), quoting Nelson, writes that this wood rat "is abundant everywhere [in the neighborhood of Manzanilla, Colima] on the lower parts of the wooded hill slopes and adjacent dry ground covered with mesquite and other seed-bearing trees. It is strictly nocturnal, and usually lives in holes or burrows at the foot of a tree or under some convenient shelter, from which its pathway or trail, neatly cleared of brush, leaves, and twigs, leads away. It lives also in ledges of loose rock, and in a few such places small collections of sticks, shells of land crabs, and other *Neotoma* bric-a-brac were found."

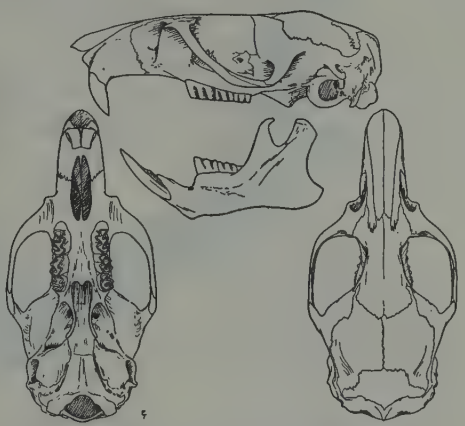


Fig. 387. *Neotoma alleni alleni,* Chamela Bay, Jalisco, No. 80946 Mich., ♂, X 1.

Neotoma alleni alleni Merriam

1892. *Neotoma alleni* Merriam, Proc. Biol. Soc. Washington, 7:168, September 29, type from Manzanillo, Colima.

MARGINAL RECORDS.—Sinaloa: Rosario (Goldman, 1938e:498); Acaponeta (91523 BS). Colima: Colima (33193/45198 BS); Armería (33190/45195 BS); thence up coast to point of beginning.

Neotoma alleni elattura (Osgood)

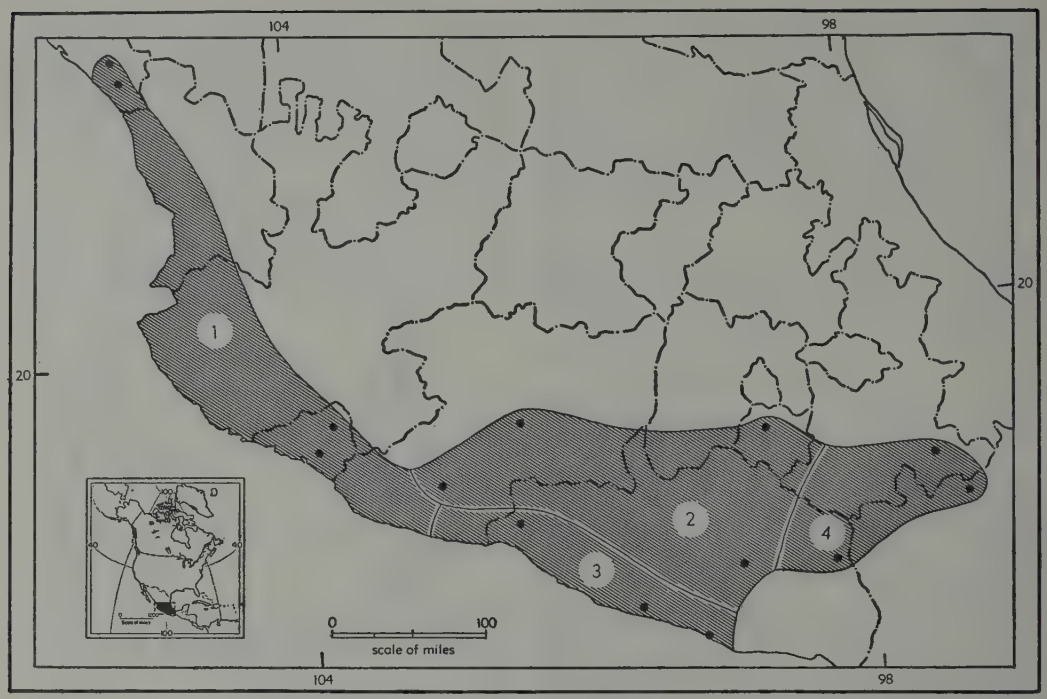
1938. *Hodomys vetulus elatturus* Osgood, Field Mus. Nat. Hist., Publ. 431, Zool. Ser., 20(35):475, December 31, type from Cuapongo, Guerrero.
1952. *Neotoma alleni ellatura,* Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:241, April 10.

MARGINAL RECORDS.—Michoacán: La Huacana (Kelson, 1952:241). Morelos: Cañon del Lobo, 6 mi. W Yautepec (Davis and Russell, 1954:77). Guerrero: Chilpancingo (Kelson, 1952:242). Michoacán: 7 mi. S Tumbiscatío, 2700 ft. (*ibid.*). Type locality not found but it is near Chilpancingo.

Neotoma alleni guerrerensis (Goldman)

1938. *Hodomys alleni guerrerensis* Goldman, Jour. Washington Acad. Sci., 28:498, November 15, type from Acapulco, Guerrero.
1952. *Neotoma alleni guerrerensis,* Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:241, April 10.

MARGINAL RECORDS.—Guerrero: El Limón (126535 BS); 5 mi. SE Tecpan, 50 ft. (38660 KU); type locality.



Map 396. *Neotoma alleni.*

1. *N. a. alleni* 2. *N. a. elattura* 3. *N. a. guerrerensis* 4. *N. a. vetula*

Neotoma alleni vetula (Merriam)

1894. *Hodomys vetulus* Merriam, Proc. Acad. Nat. Sci. Philadelphia, 46:236, September 24, type from Tehuacán, Puebla.

1952. *Neotoma alleni vetula,* Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:241, April 10.

MARGINAL RECORDS.—Puebla: type locality. Oaxaca: Teotitlán, 950 m. (Hooper, 1947:55). Guerrero: Tlalixtaquilla (70066 BS).

Subgenus **Teanopus** Merriam

Accorded subgeneric rank by Burt and Barkalow, Jour. Mamm., 23:296, August 14, 1942.

1903. *Teanopus* Merriam, Proc. Biol. Soc. Washington, 16:81, May 29. Type, *Teanopus phenax* Merriam.

Skull resembling that of *Neotoma* and *Teonoma,* but auditory bullae enormously inflated ventrally, subwheel-shaped, blunt anteriorly, nearly parallel, almost exactly as in *Xenomys*; antorbital slits large and broadly open; sphenoidal vacuities open; braincase without temporal shield; lower jaw with distinct prominence over root of incisor; angle elongate, its lower border strongly inflected and upturned, forming a long shallow trough as in *Teonoma,* but less extreme; infracondylar notch deeper than in either *Neotoma* or *Teonoma*; m3 with re-entrant enamel loop on inner side passing obliquely forward in front of its mate on outer side, thus approaching the condition in *Hodomys* (after Merriam, 1903:81).

There is but one known species, *N. phenax.*

Neotoma phenax (Merriam)
Sonoran Wood Rat

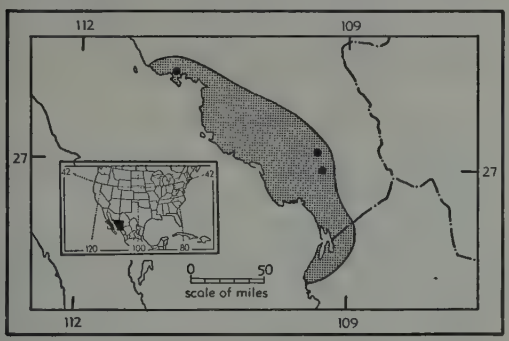
1903. *Teanopus phenax* Merriam, Proc. Biol. Soc. Washington, 16:81, May 29, type from Camoa, Río Mayo, Sonora.

1942. [*Neotoma*] *phenax,* Burt and Barkalow, Jour. Mamm., 23:289, August 14.

External measurements of the type, an adult female, are: 352; 172; 37.5. Corresponding, average, measurements of three topotypes are: 365, 183, 37.7. Upper parts buffy gray; underparts yellowish white

anteriorly, plumbeous showing through posteriorly; tail unicolored dusky.

MARGINAL RECORDS.—Sonora (Burt, 1938:62): San José de Guaymas; type locality; Chinobampo.



Map 397. *Neotoma phenax.*

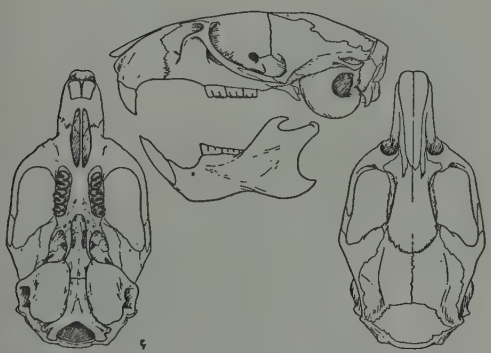


Fig. 388. *Neotoma phenax,* Camoa, Río Mayo, Sonora, No. 86067 M.V.Z., ♀, X 1.

Genus **Xenomys** Merriam—Magdalena Rat

1892. *Xenomys* Merriam, Proc. Biol. Soc. Washington, 7:160, September 29. Type, *Xenomys nelsoni* Merriam.

Skull in general resembling that of *Neotoma;* supraorbital shelf much elevated and beaded; lacrimals much enlarged; auditory bullae greatly enlarged and inflated, and parallel to long axis of skull; slight postorbital process present; paroccipital processes long and stout; interparietal much enlarged; enamel pattern of occlusal surface of m3 S-shaped much as in subgenus *Hodomys.*

The genus is monotypic.

Xenomys nelsoni Merriam
Magdalena Rat

1892. *Xenomys nelsoni* Merriam, Proc. Biol. Soc. Washington, 7:161, September 29, type from Hda. Magdalena, between city of Colima and Manzanillo, Colima.

External measurements of 3 males are, respectively: 315, 300, 335; 155, 143, 170; 31, 30, 32. "Upper parts fulvous or tawny-rufous, . . . back sparsely mixed with black-tipped hairs; an ill-defined dusky ring around each eye, above which is a whitish spot about as large as the eye itself; . . . tail concolor, dark umber-brown all around; . . . underparts creamy white to the very roots of the hairs except along the sides of the belly, where the basal part of the fur is plumbeous; line of demarkation between colors of upper and lower parts everywhere sharp and distinct." (Merriam, 1892:162).

MARGINAL RECORDS.—Jalisco: Chamela Bay (80945 Univ. Michigan). Colima: type locality; Armería (Merriam, 1892:163).

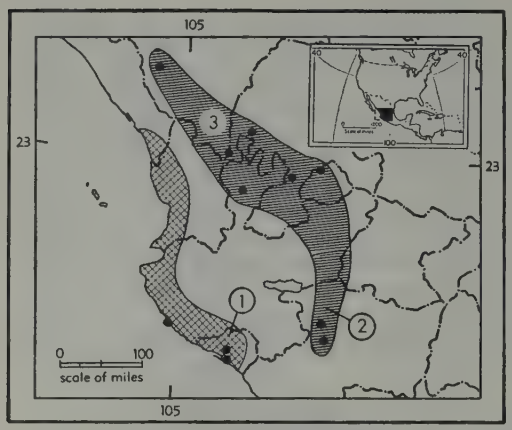
Fig. 389. *Xenomys nelsoni,* Chamela Bay, Jalisco, No. 80945 Mich., ♀, X 1.

Genus **Nelsonia** Merriam—Diminutive Wood Rat

1897. *Nelsonia* Merriam, Proc. Biol. Soc. Washington, 11:277, December 17. Type, *Nelsonia neotomodon* Merriam.

Skull resembling that of a large *Peromyscus* but more nearly flat; zygomata heavier, less depressed, and more spreading anteriorly; inferior angle of antorbital slit thickened and protruding forward and outward as distinct process; auditory bullae sub-conical as in *Peromyscus* and *Hodomys,* not bullate as in *Neotoma* and *Xenomys*; braincase depressed as in *Peromyscus,* not elevated as in *Neotoma, Xenomys,* and *Hodomys*; incisive foramina large and open, broader anteriorly than in *Neotoma* or *Peromyscus*; coronoid process of mandible small, hardly larger than in *Peromyscus* (after Merriam, 1897:277–278); M3 with single external re-entrant angle, which nearly divides tooth into separate prisms; m2 with one internal and one external re-entrant angle; m3 with but one re-entrant angle and that internal.

The genus is monotypic.



Map 398. *Xenomys* and *Nelsonia*.

Guide to kinds
1. *Xenomys nelsoni*
2. *Nelsonia neotomodon goldmani*
3. *Nelsonia neotomodon neotomodon*

Nelsonia neotomodon
Diminutive Wood Rat

Revised by Hooper, Occas. Papers Mus. Zool., Univ. Michigan, 558:1–12, 1 fig., 1 map, September 17, 1954.

External measurements: 233–249; 106–129; 27–30; 22–23. Greatest length of skull, 31.9–32.8; zygomatic breadth, 16.5–17.8; alveolar length of cheek-teeth, 6.2–6.7. Upper parts grayish brown to dark slaty gray, washed with pale ochraceous to black; sides tending to be more ochraceous than back; underparts white, hairs plumbeous basally; tail dusky above and white below; tip of tail white in subspecies *neotomodon*; cheek-teeth prismatic as in *Neotoma*, but prisms alternate instead of opposite; lateral face of inferior part of zygomatic root of zygomatic arch concave.

The diminutive wood rat lives where there are cliffs, or areas of rimrock, among conifers at elevations of from 6000 to at least 10,000 ft.—ordinarily in cool and moist places where there are crevices that provide shelter.

Fig. 390. *Nelsonia neotomodon goldmani*, Mt. Tancítaro, Michoacán, No. 125813 U.S.N.M., ♂, X 1.

Nelsonia neotomodon goldmani Merriam

1903. *Nelsonia goldmani* Merriam, Proc. Biol. Soc. Washington, 16:80, May 29, type from Mt. Tancítaro, Michoacán.
1954. *Nelsonia neotomodon goldmani*, Hooper, Occas. Papers Mus. Zool., Univ. Michigan, 558:7, September 17.

MARGINAL RECORDS.—Michoacán: Cerro Patambán (Hooper, 1954:7); type locality.

Nelsonia neotomodon neotomodon Merriam

1897. *Nelsonia neotomodon* Merriam, Proc. Biol. Soc. Washington, 11:278, December 17, type from mountains near Plateado, 8200 ft., Zacatecas.

MARGINAL RECORDS (Hooper, 1954:7).—Durango: 1½ mi. W San Luis, 8000 ft.; *E slope Cerro Huehuento, 9500 ft.* Zacatecas: Sierra de Valparaíso, W of Valparaíso, 8700 ft. Aguascalientes: 15 mi. W Presa Calles, Sierra Fría, 8000–8200 ft. Zacatecas: type locality. Jalisco: Sierra Madre near Bolaños, 7600 ft. Zacatecas: Sierra Madre, 8500 ft., between Huazamata, Durango, and San Juan Capistrano, Zacatecas.

Genus Rheomys Thomas—Water Mice

1906. *Rheomys* Thomas, Ann. Mag. Nat. Hist., ser. 7, 17: 421, April. Type, *Rheomys underwoodi* Thomas.

Small glossy blackish mice, often frosted with white-tipped hairs; lower parts paler than, but not sharply distinct from, upper parts; hind feet fimbriated and slightly webbed. Skull relatively smooth, well constricted interorbitally; anterior palatine slits long; upper incisors sometimes grooved so that with wear the edge becomes deeply notched.

There is some evidence suggesting that this group would be better treated as a subgenus of the South American fish mice, genus *Ichthyomys*; certainly the two do not differ much morphologically.

Water mice inhabit the smaller jungle streams, and usually are caught by placing the trap in the water. Seemingly they feed on snails but on what else is unknown. They range into South America.

Key to Species of Rheomys

1. Tail less than 100; occurring in eastern Panamá. . . . . *R. raptor*, p. 710
1′. Tail more than 100; not occurring in eastern Panamá.
  2. Occurring south of Nicaragua.
    3. Tail more than 125. *R. underwoodi*, p. 709
    3′. Tail less than 125. . *R. hartmanni*, p. 710
  2′. Occurring north of Nicaragua. *R. thomasi*, p. 708

Rheomys thomasi
Thomas' Water Mouse

External measurements of the types of *R. t. thomasi* (♀), *R. t. stirtoni* (♂), and *R. t. chiapen-*

Map 399. *Rheomys.*

1. *R. thomasi chiapensis*
2. *R. thomasi stirtoni*
3. *R. thomasi thomasi*
4. *R. underwoodi*
5. *R. hartmanni*
6. *R. raptor*

sis (subadult ♂) are, respectively: 253, 233, 208; 120, 125, 114; 32, 33, 30; 7, 6, 9. Color essentially as in *underwoodi*. Skull smaller than that of *underwoodi*; braincase lower, narrower; anterior palatine foramina longer.

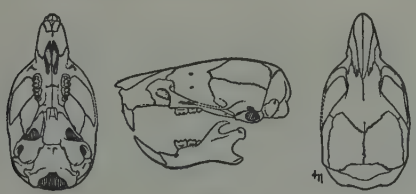


Fig. 391. *Rheomys thomasi stirtoni*, Los Esesmiles, Chalatenango, El Salvador, No. 12565 U.C.L.A., ♂, X 1.

Rheomys thomasi chiapensis Hooper

1947. *Rheomys thomasi chiapensis* Hooper, Jour. Mamm., 28:53, February 17, type from Prusia, 1100 m., Chiapas. Known only from the type locality.

Rheomys thomasi stirtoni Dickey

1928. *Rheomys thomasi stirtoni* Dickey, Proc. Biol. Soc. Washington, 41:12, February 1, type from Los Esesmiles, 8000 ft., Chalatenango, El Salvador. Known only from the type locality.

Rheomys thomasi thomasi Dickey

1928. *Rheomys thomasi* Dickey, Proc. Biol. Soc. Washington, 41:11, February 1, type from Finca San Felipe, Mt. Cacaguatique, 3500 ft., San Miguel, El Salvador. Known only from the type locality.

Rheomys underwoodi Thomas
Underwood's Water Mouse

1906. *Rheomys underwoodi* Thomas, Ann. Mag. Nat. Hist., ser. 7, 17:422, April, type from Tres Ríos, Cartago, Costa Rica.

External measurements of the type, a male, are: length of head and body, 130; tail, 150; hind foot, 35; ear, 5. Upper parts brown, darkened by black-tipped overhairs, tips of longer overhairs white; underparts grayish white; forefeet white, hind feet dark brown above, fringe-hairs glossy white; tail dark brown above, paler below. "Skull smoothly rounded, interorbital region broad, its edges rounded, palatal foramina not extending back to level of the front of first upper molars, incisors normal, narrow, and slightly rounded in front" (Goodwin, 1946:403).

MARGINAL RECORDS.—Costa Rica: type locality. Panamá: El Volcán de Chiriquí (Goodwin, 1946:403).

Rheomys hartmanni Enders
Hartmann's Water Mouse

1939. *Rheomys hartmanni* Enders, Proc. Acad. Nat. Sci. Philadelphia, 90:295, February 3, type from hot springs on Río Cotito, Chiriquí, 4900 ft., Panamá. Known only from the type locality.

External measurements of the type, an adult female, are: 212; 104; 25. Upper parts "uniformly and finely mixed black and cinnamon; underparts pale silvery gray; guard hairs not conspicuously longer than underfur, both Plumbeous basally; . . . fore and hind feet Sepia, the fringing bristles on hind feet grayish white. Skull small and flat, frontal region depressed; audital bullae heavy, narrow" (Goodwin, 1946:403).

Rheomys raptor Goldman
Goldman's Water Mouse

1912. *Rheomys raptor* Goldman, Smiths. Miscl. Coll., 60(2):7, September 20, type from near head Río Limón, Mt. Pirri, 4500 ft., Panamá. Known only from the type locality.

External measurements of the type, an adult male, are: 201; 94; 23.5; 7.7 (dry). Upper parts finely mixed black and cinnamon, black predominating on back, especially on rump; underparts pale smoky gray or slightly darker; sides of rump with a few projecting white hairs. Skull "smoothly rounded, the frontal region not depressed as in *Ichthyomys hydrobates*; audital bullae short and rounded; incisors of the ordinary murine type; molars about as in *Ichthyomys hydrobates*" (Goldman, 1912b:8).

SUBFAMILY MICROTINAE

Revised by Miller, N. Amer. Fauna, 12:1–84, 3 pls., 40 figs., July 23, 1896. Synopsis of North American species by Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5: 373–498, 149 figs., January 15, 1953.

Thickset animals with bluntly rounded muzzles; most of each limb hidden in the general integument of the trunk, thus resulting in a short-legged appearance; five toes on each foot; tail never so long as head and body; postorbital processes absent; outer wall of infraorbital canal transverse or oblique to long axis of skull and with front edge emarginate or undercut and not projecting in front of anterior border of superior ramus of maxillary root of zygoma; palatine bones notably thick; ectopterygoid plates well developed; cheek-teeth twelve (three on each side of upper- and lower-jaw), long crowned and in most genera persistently growing; occlusal faces made up of triangles and loops.

KEY TO NORTH AMERICAN GENERA OF MICROTINAE
(after Ellerman, *et al.*, 1941:550–555)

1. Lower incisors wholly lingual to molars and terminating in horizontal ramus opposite, or in front of, alveolus of m3.
   2. Cheek-teeth longitudinally complex (many loops); inner and outer salient angles approximately equal in size; m1 with seven closed triangles between terminal loops; supraorbital ridges strong but not fusing in interorbital region; foreclaws of D2 and D3 with periodic seasonal (winter) extra basal growths. . . . . *Dicrostonyx*, p. 764
   2′. Cheek-teeth longitudinally simplified (few loops); inner salient angles of upper molars and outer angles of lower molars smaller than those of the opposite sides; m1 with three closed triangles between termination loops (or with two transverse loops, if closed triangles absent); supraorbital ridges fusing in adults and forming median orbital crest; foreclaws not developing seasonal outgrowths.
      3. Posterior palate not terminating as simple transverse shelf; upper incisors strongly grooved; tooth-rows not, or less widely, divergent posteriorly; forefeet not much specialized in that claws are not notably thickened, soles almost hairless and ungual phalanges not notably lengthened. *Synaptomys*, p. 760
      3′. Posterior palate terminating as a simple transverse shelf; upper incisors not grooved; tooth-rows widely divergent posteriorly; forefeet specialized in that claws of some individuals are notably thickened, soles almost concealed by hairs, and ungual phalanges notably lengthened. *Lemmus*, p. 758

1′. Lower incisors passing from lingual to labial side of molars between bases of roots of m2 and m3 and ascending behind molars to termination within or near condylar process.
   4. Cheek-teeth rooted in adults.
      5. External form modified for aquatic life in that tail is laterally compressed, and swimming fringes on hind feet conspicuous; basal length of skull more than 50 mm. . . . . *Ondatra*, p. 754
      5′. External form not modified for aquatic life; basal length of skull less than 50 mm.

6. Posterior palate terminating as a simple transverse shelf; lower molars with inner re-entrant angles little if any deeper than outer re-entrant angles. . . . . *Clethrionomys*, p. 711

6′. Posterior palate terminating with a median spinous process converted into a sloping septum between posterolateral pits; lower molars with inner re-entrant angles deeper than outer. . *Phenacomys*, p. 718

4′. Cheek-teeth not rooted (evergrowing) in adults.

7. External form lemminglike in that ears are so short as to be concealed in fur and tail is so short as to extend scarcely beyond hind feet in prepared skins; tympanic bullae and mastoid bullae much enlarged (see Fig. 416); M1 and M2 with traces of extra complexities between main inner folds (m1 with 5 closed triangles). . . . . *Lagurus*, p. 752

7′. External form volelike (not lemminglike) in that ears are not entirely concealed in fur and tail extends beyond hind feet in prepared skins; tympanic bullae and mastoid bullae of normal size (see Figs. 415 and 417); M1 and M2 usually without traces of extra complexities between the main inner folds (m1 with 3, 4, or 5 closed triangles).

8. Underfur muskratlike in that it obviously is adapted to aquatic existence; m3 with triangles (only 2 between terminal loops) tightly closed; alveolar length of upper molars more than 9.9 mm. *Neofiber*, p. 753

8′. Underfur mouselike in that it is not adapted to aquatic existence; m3 without tightly closed triangles; alveolar length of upper molars less than 9.9 mm. . . . . *Microtus*, p. 721

Genus **Clethrionomys** Tilesius—Red-backed Mice

North American species revised (under name *Evotomys*) by V. Bailey, Proc. Biol. Soc. Washington, 11:113–138, May 13, 1897.

1850. *Clethrionomys* Tilesius, Isis, 2:28. Type, *Mus glareolus* Schreber.

1874. *Evotomys* Coues, Proc. Acad. Nat. Sci. Philadelphia, 26:186, December 15. Type, *Mus rutilus* Pallas.

1900. *Craseomys* Miller, Proc. Washington Acad. Sci., 2:87, July 26. Type, *Hypudaeus rufocanus* Sundevall.

1905. *Paulomys* Thomas, Ann. Mag. Nat. Hist., ser. 7, 15: 493. Type, *Evotomys smithii* Thomas.

Ellerman and Morrison-Scott (Checklist of Palaearctic and Indian mammals, 1758–1946, British Museum (Natural History), November 19, 1951), on page 659, suggest that the three names listed below are synonyms of *Clethrionomys*.

1898. *Aschizomys* Miller, Proc. Acad. Nat. Sci. Philadelphia, p. 369, October 11. Type, *Aschizomys lemminus* Miller.

1911. *Caryomys* Thomas, Abstr. Proc. Zool. Soc. London, p. 4, February14, Proc. Zool. Soc. London, p. 175. Type, *Microtus* (*Eothenomys*) *inez* Thomas.

1935. *Neoaschizomys* Tokuda, Mem. Coll. Sci. Kyoto, ser. B, 10(No. 3):241. Type, *Neoaschizomys sikotanensis* Tokuda.

External measurements: 120–165; 50–53; 16–21.0; 10–16. Weight (of *C. gapperi*), 16–42 grams; basal length of skull, 21.0–24.3; zygomatic breadth, 12.5–14.4. External form not much modified, back usually red; mammae 2–2 = 8; plantar pads 6. Skull "weak"; temporal ridges poorly developed and not fused anteriorly in interorbital region in adults; interorbital constriction medium; braincase broad; bullae relatively large, lacking spongy tissue (in living species); palate ends posteriorly as straight transverse shelf with no median septum; cheek-teeth rooted in adults.

KEY TO NORTH AMERICAN SPECIES OF CLETHRIONOMYS

1. Postpalatal bridge incomplete except in an occasional extremely old individual; tail short, thick, and with closely set bristly hairs. *C. rutilus*, p. 711

1′. Postpalatal bridge complete even in half-grown young; tail slender, and with short hairs except at the tip where hairs are longer.

2. Postpalatal bridge truncate posteriorly; dentition relatively light, enamel pattern of M3 more complex; postpalatal process light. . . . . *C. gapperi*, p. 713

2′. Postpalatal bridge with median posteriorly directed spine; dentition relatively heavy, enamel pattern of M3 more simplified, postpalatal process heavy. *C. occidentalis*, p. 716

Clethrionomys rutilus
Northern Red-backed Mouse

American species revised (under name *Clethrionomys dawsoni*) by Orr, Jour. Mamm., 26:67-74, February 27, 1945. American species listed by Rausch, Jour. Washington Acad. Sci., 40:135, April 21, 1950. Canadian subspecies revised by Manning, Bull. Nat. Mus. Canada, 144:iv + 1–67, 21 figs., 1957.

External measurements: 130–158; 30–44; 18.5–21; 10–14. Upper parts bright; dorsal stripe well defined, varying from bright reddish to dark rufous; sides grayish; venter grayish with the tips of guard

hairs varying from whitish to deep buff; tail sharply bicolored, varying from reddish to blackish above. Tail short, thick and closely set with bristly hairs. Postpalatal bridge incomplete except occasionally in extremely old individuals; enamel patterns of M3 and m1 more complex than in *C. occidentalis*. Embryos for 17 females from Alaska and Yukon averaged 6.6 (5 to 9).

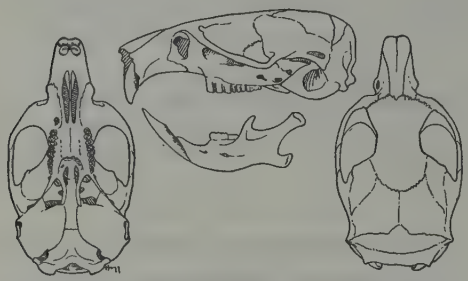


Fig. 392. *Clethrionomys rutilus dawsoni*, E side Deadman Lake, 1800 ft., 15 mi. SE Northway, Alaska, No. 21410 K.U., ♀, X 1½.

Clethrionomys rutilus albiventer Hall and Gilmore

1932. *Clethrionomys albiventer* Hall and Gilmore, Univ. California Publ. Zool., 38:398, September 17, type from Sevoonga, 2 mi. E of North Cape, St. Lawrence Island, Bering Sea, Alaska. Known only from the type locality.
1952. *Clethrionomys rutilus albiventer*, Rausch, Jour. Parasit., 38:416, October.

Clethrionomys rutilus dawsoni (Merriam)

1888. *Evotomys dawsoni* Merriam, Amer. Nat., 22:650, July, type from Finlayson River, 3000 ft., a northern source of the Liard River, lat. 61° 30′ N, long. 129° 30′ W, Yukon.
1950. *Clethrionomys rutilus dawsoni*, Rausch, Jour. Washington Acad. Sci., 40:134, April 21.
1898. *Evotomys alascensis* Miller, Proc. Acad. Nat. Sci. Philadelphia, 50:364, October 15, type from St. Michael, Norton Sound, Alaska. (See Osgood, N. Amer. Fauna, 24:34, November 23, 1904.)

MARGINAL RECORDS (Hall and Cockrum, 1953:383, unless otherwise noted).—Alaska: 1½ mi. ESE Point Barrow, 10 ft.; 1½ mi. W, ¾ mi. N Umiat, 69° 22′ 18″, 152° 08′ 10″, 370 ft. Mackenzie: Fort McPherson; Bathurst Inlet. Keewatin (Manning, 1957:57): Baker Lake; Smoke Lake. Manitoba: Nonala, 80 mi. N Churchill. Mackenzie: Fort Reliance; Fort Rae; Fort Providence. British Columbia: Summit Pass, 4500 ft., 10 mi. S, 70 mi. W Fort Nelson; Junction. Alaska: Juneau; Yakutat; Mt. Logan area, Hubrick's Camp [N side Chitina River, 25 mi. W Alaska-Yukon line]; Moose Camp, Kenai Peninsula; Ugaguk River, near outlet Becharof Lake; Nushagak; Kuskokwim River (Strecker *et al.*, 1952:479); St. Michael; Teller; Lava Lake (Quay, 1951:93); *Kuzitrin Lake* (*ibid.*); *Mount Boyan* (*ibid.*); *Trail Creek* (*ibid.*).

Clethrionomys rutilus glacialis Orr

1945. *Clethrionomys dawsoni glacialis* Orr, Jour. Mamm., 26:71, February 27, type from Glacier Bay, Alaska.
1950. *Clethrionomys rutilus glacialis*, Rausch, Jour. Washington Acad. Sci., 40:135, April 21.

MARGINAL RECORDS (Hall and Cockrum, 1953:383).—Alaska (Glacier Bay): Coppermine; *Bartlett Cove.*

Clethrionomys rutilus insularis (Heller)

1910. *Evotomys dawsoni insularis* Heller, Univ. California Publ. Zool., 5:339, March 5, type from west side Canoe Passage, Hawkins Island, Prince William Sound, Alaska.
1950. *Clethrionomys rutilus insularis*, Rausch, Jour. Washington Acad. Sci., 40:135, April 21.

MARGINAL RECORDS (Hall and Cockrum, 1953:384).—Alaska (Prince William Sound): type locality; Northeast Bay, Hinchinbrook Island.

Clethrionomys rutilus orca (Merriam)

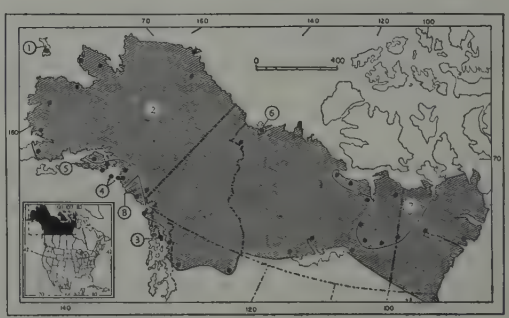
1900. *Evotomys orca* Merriam, Proc. Washington Acad. Sci., 2:24, March 14, type from Orca, Prince William Sound, Alaska.
1950. *Clethrionomys rutilus orca*, Rausch, Jour. Washington Acad. Sci., 40:135, April 21.

MARGINAL RECORDS (Hall and Cockrum, 1953:384).—Alaska (Prince William Sound): Valdez Narrows; Cordova; La Touche, La Touche Island; head of Port Nellie Juan.

Clethrionomys rutilus platycephalus Manning

1957. *Clethrionomys rutilus platycephalus* Manning, Bull. Nat. Mus. Canada, 144 (for 1956—Biol. Series, No. 49): 50, prior to March 15, type from Tuktoyaktuk, 100 ft., lat. 69° 22′, long. 133° 05′, Mackenzie.

MARGINAL RECORDS (Manning, 1957:57).—Mackenzie: type locality; *8 mi. S of type locality.*



Map 400. *Clethrionomys rutilus.*

1. *C. r. albiventer*
2. *C. r. dawsoni*
3. *C. r. glacialis*
4. *C. r. insularis*
5. *C. r. orca*
6. *C. r. platycephalus*
7. *C. r. washburni*
8. *C. r. watsoni*

Clethrionomys rutilus washburni Hanson

1952. *Clethrionomys rutilus washburni* Hanson, Jour. Mamm., 33:500, November 19, type from Perry River, lat. 67° 34′ N, long. 102° 07′ W, Mackenzie.

MARGINAL RECORDS (Manning, 1957:57).—Mackenzie: type locality; Deer Pass; Thelon Cabin; Artillery Lake; Aylmer Lake; Coppermine; Port Epworth.

Clethrionomys rutilus watsoni Orr

1945. *Clethrionomys dawsoni watsoni* Orr, Jour. Mamm., 26:73, February 27, type from Cape Yakataga, Alaska. Known only from the type locality.
1950. *Clethrionomys rutilus watsoni*, Rausch, Jour. Washington Acad. Sci., 40:135, April 21.

Clethrionomys gapperi
Gapper's Red-backed Mouse

External measurements: 120–158; 30–50; 16–21; 12–16; weight, 16–42 grams. Dorsal stripe varies from bright chestnut, through hazel, to yellowish brown (occasionally black); sides gray to buffy gray, sometimes with yellowish wash; venter silvery some having buffy wash; tail bicolor, whitish to gray below, dark brown to black above. Tail slender, short-haired except at tip where hairs are longer. Post-palatal bridge complete even in half-grown young with result that posterior margin of palate forms solid, truncate shelf; dentition relatively light; enamel patterns of M3 and m1 more complex than in *C. occidentalis*. Usual number of embryos 4 to 6 (extremes recorded are 3 to 8).

Clethrionomys gapperi arizonensis Cockrum and Fitch

1952. *Clethrionomys gapperi arizonensis* Cockrum and Fitch, Univ. Kansas Publ., Mus. Nat. Hist., 5:291, November 15, type from Little Colorado River, 8300 ft., White Mts., Apache Co., Arizona.

MARGINAL RECORDS (Hall and Cockrum, 1953:385).—Arizona: type locality; *Hannagan Creek, 8600 ft.*

Clethrionomys gapperi athabascae (Preble)

1908. *Evotomys gapperi athabascae* Preble, N. Amer. Fauna, 27:178, October 26, type from Fort Smith, Slave River, Mackenzie.
1932. *Clethrionomys gapperi athabascae*, Harper, Jour. Mamm., 13:28, February 9.

MARGINAL RECORDS (Hall and Cockrum, 1953:385, unless otherwise noted).—Mackenzie: Fort Resolution; Soulier Lake. *Northern Saskatchewan and NW Manitoba.* Alberta: Calling River; Edmonton; Tornado Pass. British Columbia: Invermere; *Thompson Pass* (Cowan and Guiguet, 1956:203). Alberta: Jasper National Park. British Columbia (Cowan and Guiguet, 1956:203): *Moose Pass*; Tupper Creek; Charlie Lake; Laurier Pass; Liard River.

Clethrionomys gapperi brevicaudus (Merriam)

1891. *Evotomys gapperi brevicaudus* Merriam, N. Amer. Fauna, 5:119, July 30, type from 3 mi. N Custer, 6000 ft., Black Hills, Custer Co., South Dakota.
1942. *Clethrionomys gapperi brevicaudus*, Bole and Moulthrop, Sci. Publ. Cleveland Mus. Nat. Hist., 5:153, September 11.

MARGINAL RECORDS (Hall and Cockrum, 1953:385).—Wyoming: 3 mi. NW Sundance, 5900 ft. South Dakota: Deadwood; *16 mi. SW Rapid City; type locality.* Wyoming: *12 mi. SE Newcastle; 1½ mi. E Buckhorn, 6150 ft.*

Clethrionomys gapperi carolinensis (Merriam)

1888. *Evotomys carolinensis* Merriam, Amer. Jour. Sci., ser. 3, 36:460, December, type from Roan Mtn., 6000 ft., Mitchell Co., North Carolina.
1939. *Clethrionomys gapperi carolinensis*, R. Kellogg, Proc. Biol. Soc. Washington, 52:38, March 11.

MARGINAL RECORDS (Hall and Cockrum, 1953:386).—West Virginia: Hardy County; *Franklin*; Cranberry Glades. Virginia: Whitetop Mtn. North Carolina: type locality; Highlands. Tennessee: Spence Field, 1 mi. W Thunderhead Mtn. West Virginia: *Odd*; Cheat Mtn., 3 mi. E Cheat Bridge.

Clethrionomys gapperi cascadensis Booth

1945. *Clethrionomys gapperi cascadensis* Booth, Murrelet, 26:27, August 10, type from 2 mi. S Blewett Pass, 3000 ft., Kittitas Co., Washington.

MARGINAL RECORDS.—British Columbia: Alta Lake (Cowan and Guiguet, 1956:205). Washington (Hall and Cockrum, 1953:386): Nooksak River; Pasayten River; Liberty; Simcoe Mts.; Mt. St. Helens; *Swamp Creek.*

Clethrionomys gapperi galei (Merriam)

1890. *Evotomys galei* Merriam, N. Amer. Fauna, 4:23, October 8, type from Ward, 9500 ft., Boulder Co., Colorado.
1931. *Clethrionomys gapperi galei*, Hall, Univ. California Publ. Zool., 37:6, April 10.

MARGINAL RECORDS (Hall and Cockrum, 1953:386).—Alberta: "extreme southwestern Alberta". Montana: Big Snowy Mts. Wyoming: 6¾ mi. W, 2 mi. S Buffalo; 22 mi. S, 24½ mi. W Douglas; 3 mi. ESE Browns Peak. Colorado: type locality; Lake Moraine, 10,250 ft.; 2 mi. N Gothic; 25 mi. SE Meeker. Wyoming: Bridger Pass, 18 mi. SW Rawlins; Middle Lake, 20½ mi. W, 2 mi. S Lander; Hoback Mts.; Moran. Montana: Deer Lodge County; St. Mary Lake. *British Columbia: Wall Lake* (Cowan and Guiguet, 1956:206).

Clethrionomys gapperi gapperi (Vigors)

1830. *Arvicola gapperi* Vigors, Zool. Jour., 5:204, type from between York [= Toronto] and Lake Simcoe, Ontario.
1928. *Clethrionomys gapperi gapperi*, Green, Jour. Mamm., 9:255, August 9.
1894. *Evotomys fuscodorsalis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:103, April 14, type from Trousers Lake, New Brunswick.

MARGINAL RECORDS (Hall and Cockrum, 1953:386–387).—Quebec: Godbout; Lake Edward. New York: Lake George. Connecticut: Woodstock; Glastonbury. New Jersey: Walkill Valley, near Long Lake. Virginia: Washington; Peaks of Otter; Mountain Lake; Elliot Knob. Pennsylvania: Renovo. Ontario: Middlesex County. Michigan: Alcona County; *Crawford County*; Leelanau County. Wisconsin: 1 mi. W Keshena; Beaver Dam; Worden. Minnesota: Carlton County; Lake of the Woods County. Ontario: Humboldt Bay, Lake Nipigon region. Quebec: Bark Lake.

Fig. 393. *Clethrionomys gapperi galei*, 3 mi. ESE Browns Peak, 10,000 ft., Albany Co., Wyoming, No. 17288 K.U., ♂, X 1½.

Clethrionomys gapperi gaspeanus Anderson

1943. *Clethrionomys gapperi gaspeanus* Anderson, Ann. Rept. Provancher Soc. Nat. Hist. Canada, for 1942, p. 57, September 7, type from Berry Mountain Camp, about 1500 ft., near junction of Berry Mountain Brook with Grand Cascapedia River, Matane Co., Quebec.

MARGINAL RECORDS (Hall and Cockrum, 1953:387).—Quebec: Ste. Anne de Monts; *type locality*; Red Camp, Cascapedia Valley. New Brunswick: Dalhousie; St. Leonard; Baker Lake. Quebec: Matapedia.

Clethrionomys gapperi gauti Cockrum and Fitch

1952. *Clethrionomys gapperi gauti* Cockrum and Fitch, Univ. Kansas Publ., Mus. Nat. Hist., 5:289, November 15, 1952, type from Twining, 10,700 ft., Taos Co., New Mexico.

MARGINAL RECORDS (Hall and Cockrum, 1953:388).—Colorado: 21 mi. W, 3 mi. N Saguache. New Mexico: 15 mi. SW Cimarron; Pecos Baldy, Pecos Mts.; Goat Peak, Jemez Mts. Colorado: Silverton.

Clethrionomys gapperi hudsonius Anderson

1940. *Clethrionomys gapperi hudsonius* Anderson, Rapport Annuel 1939, Société Provancher d'Histoire Naturelle du Canada, p. 73, February 29, type from Kapuskasing, on Kapuskasing River, about 64 mi. W Cochrane, Ontario.

MARGINAL RECORDS (Hall and Cockrum, 1953:388).—Manitoba: Sandhill Lake (59° 21′ N, 98° 43′ W); [Fort] Churchill. Quebec: Richmond Gulf; Lake Albanel. Ontario: Murdock Creek, S of Swastika; type locality. Manitoba: Whitemouth Lake; Pine Falls; Ilford.

Clethrionomys gapperi idahoensis (Merriam)

1891. *Evotomys idahoensis* Merriam, N. Amer. Fauna, 5:66, July 30, type from Sawtooth (Alturas) Lake, 7200 ft., E base Sawtooth Mts., Blaine Co., Idaho.
1933. *Clethrionomys gapperi idahoensis*, Whitlow and Hall, Univ. California Publ. Zool., 40:265, September 30.

MARGINAL RECORDS (Hall and Cockrum, 1953:388).—Montana: Yellow Bay, Flathead Lake region. Idaho: Salmon River Mts. [= Timber Creek, Lemhi Mts.]; 3 mi. S Victor; N rim Copenhagen Basin; Indian Creek; Edna. Oregon: 10 mi. N Harney; Kamela. Washington: Humpeg Falls. Idaho: ½ mi. E Black Lake.

Clethrionomys gapperi limitis (V. Bailey)

1913. *Evotomys limitis* V. Bailey, Proc. Biol. Soc. Washington, 26:133, May 21, type from Willow Creek, 8500 ft., a branch of the Gilita, Mogollon Mts., Catron Co., New Mexico.
1952. *Clethrionomys gapperi limitis*, Cockrum and Fitch, Univ. Kansas Publ., Mus. Nat. Hist., 5:290, November 10.

MARGINAL RECORDS (Hall and Cockrum, 1953:388).—New Mexico: Copper Canyon, Magdalena Mts.; San Mateo Peak, 10,000 ft., San Mateo Mts.; type locality.

Clethrionomys gapperi loringi (V. Bailey)

1897. *Evotomys gapperi loringi* V. Bailey, Proc. Biol. Soc. Washington, 11:125, May 13, type from Portland, Traill Co., North Dakota.
1929. *Clethrionomys gapperi loringi*, B. Bailey, Jour. Mamm., 10:162, May 9.

MARGINAL RECORDS (Hall and Cockrum, 1953:388–389).—Manitoba: Cormorant Lake, mile 42 from The Pas on the Churchill R.R. Minnesota: Kittson County; Hinckley; Minneapolis. Iowa: 5 mi. E [= ESE] Forest City. South Dakota: Fort Sisseton. North Dakota: Cannon Ball; Buford. Alberta: Cypress Hills, Eagle Butte. Saskatchewan: Wingard.

Clethrionomys gapperi maurus R. Kellogg

1939. *Clethrionomys gapperi maurus* R. Kellogg, Proc. Biol. Soc. Washington, 52:37, March 11, type from Black Mts., 4½ mi. SE Lynch, 4100 ft., Harlan Co., Kentucky.

MARGINAL RECORDS (Hall and Cockrum, 1953:389).—Kentucky: type locality. *Virginia: Big Stone Gap.*

Cletherionomys gapperi ochraceus (Miller)

1894. *Evotomys gapperi ochraceus* Miller, Proc. Boston Soc. Nat. Hist., 26:193, March 24, type from Alpine Garden, near head of Tuckerman's Ravine, Mt. Washington, 5500 ft., Coos Co., New Hampshire.
1929. [*Clethrionomys gapperi*] *ochraceus*, Goodwin, Jour. Mamm., 10:243, August 10.

MARGINAL RECORDS (Hall and Cockrum, 1953:389).—Prince Edward Island: Kensington, thence south along Atlantic Coast to Massachusetts: Wareham; Petersham. New York: St. Huberts. Quebec: Hatley. Maine: South Twin Lake. New Brunswick: *Andover*; Trousers Lake.

Clethrionomys gapperi pallescens Hall and Cockrum

1940. *Clethrionomys gapperi rufescens* R. W. Smith, Amer. Midland Nat., 24:233, July, type from Wolfville, Kings Co., Nova Scotia. Not *Arvicola rufescens* de Sélys-Longchamps, 1836, a synonym of *Clethrionomys glareolus glareolus* Schreber, 1780.

1952. *Clethrionomys gapperi pallescens* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:302, November 17, a renaming of *C. g. rufescens* R. W. Smith.

MARGINAL RECORDS (Hall and Cockrum, 1953:389). —Nova Scotia: Frizzleton, down east coast of Cape Breton Island and Nova Scotia and back up west coast to Albany; thence to James River.

Clethrionomys gapperi paludicola Doutt

1941. *Clethrionomys gapperi paludicola* Doutt, Proc. Biol. Soc. Washington, 54:162, December 8, type from Pymatuning Swamp, 1000 ft., 4 mi. W Linesville, Crawford Co., Pennsylvania.

MARGINAL RECORDS (Hall and Cockrum, 1953:389). —Ohio: Conneaut Creek [= Farnham]; *Padanaram*. Pennsylvania: type locality.

Clethrionomys gapperi phaeus (Swarth)

1911. *Evotomys phaeus* Swarth, Univ. California Publ. Zool., 7:127, January 12, type from Marten Arm, Boca de Quadra, Alaska.

Map 401. Subspecies of *Clethrionomys gapperi*, and ranges of the two other American species.

Guide to kinds

1. *C. gapperi arizonensis*
2. *C. gapperi athabascae*
3. *C. gapperi brevicaudus*
4. *C. gapperi carolinensis*
5. *C. gapperi cascadensis*
6. *C. gapperi galei*
7. *C. gapperi gapperi*
8. *C. gapperi gaspeanus*
9. *C. gapperi gauti*
10. *C. gapperi hudsonius*
11. *C. gapperi idahoensis*
12. *C. gapperi limitis*
13. *C. gapperi loringi*
14. *C. gapperi maurus*
15. *C. gapperi ochraceous*
16. *C. gapperi pallescens*
17. *C. gapperi paludicola*
18. *C. gapperi phaeus*
19. *C. gapperi proteus*
20. *C. gapperi rhoadsi*
21. *C. gapperi rupicola*
22. *C. gapperi saturatus*
23. *C. gapperi sitkensis*
24. *C. gapperi solus*
25. *C. gapperi uintaensis*
26. *C. gapperi ungava*
27. *C. gapperi wrangeli*
28. *C. rutilus*
29. *C. occidentalis*

1952. *Clethrionomys gapperi phaeus,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:302, November 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:390). —Alaska: Chickamin River; type locality. British Columbia: Fort [= Port] Simpson.

Clethrionomys gapperi proteus (Bangs)

1897. *Evotomys proteus* Bangs, *in* V. Bailey, Proc. Biol. Soc. Washington, 11:137, May 13, type from Hamilton Inlet, Labrador.
1938. *Clethrionomys gapperi proteus,* C. F. Jackson, Jour. Mamm., 19:433, November 14.

MARGINAL RECORDS (Hall and Cockrum, 1953:390). —Labrador: Nain; Black Bay; near mouth of Moise River. Not found: Assiwaban River and Windsor.

Clethrionomys gapperi rhoadsii (Stone)

1893. *Evotomys gapperi rhoadsii* Stone, Amer. Nat., 27:55, January, type from Mays Landing, Atlantic Co., New Jersey (about half way between Mare Run and Mays Landing dam on Great Egg Harbor River—see Miller and Kellogg, Bull. U.S. Nat. Mus., 205:570, March 3, 1955).
1942. *Clethrionomys gapperi rhoadsii,* Bole and Moulthrop, Sci. Publ. Cleveland Mus. Nat. Hist., 5:153, September 11.

MARGINAL RECORDS (Rhoads, 1903:97, unless otherwise noted).—New York: southern New York (Miller, 1900: 111). New Jersey: *Lakehurst* (Bole and Moulthrop, 1942: 153); type locality; *Tuckahoe; Port Norris; Mauricetown; Ancora; Medford.*

Clethrionomys gapperi rupicola E. L. Poole

1949. *Clethrionomys gapperi rupicola* E. L. Poole, Not. Naturae, Acad. Nat. Sci. Philadelphia, 212:2, January 21, type from Pinnacle, Berks Co., Pennsylvania. Known only from Kittatinny Ridge of Berks and Schuylkill cos., Pennsylvania.

Clethrionomys gapperi saturatus (Rhoads)

1894. *Evotomys gapperi saturatus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:284, October 23, type from Nelson, British Columbia, on Kootenai River, 30 mi. N northern boundary of Washington.
1933. [*Clethrionomys gapperi*] *saturatus* Whitlow and Hall, Univ. California Publ. Zool., 40:265, September 30.

MARGINAL RECORDS (Hall and Cockrum, 1953:390, unless otherwise noted).—British Columbia: Hazelton; Summit Lake; Yellowhead Lake (Cowan and Guiguet, 1956: 207); Glacier; Kitchener. Montana: Prospect Creek. Idaho: Craig Mtn. Washington: Sherman Creek Pass. British Columbia (Cowan and Guiguet, 1956:207): Anarchist Mtn.; Botanie Lake; Stuie; W end Eutsuk Lake; Lakelse. Bear Lake, British Columbia, not found.

Clethrionomys gapperi stikinensis Hall and Cockrum

1952. *Clethrionomys gapperi stikinensis* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:305, November 17, type from Stikine River at Great Glacier, British Columbia.

MARGINAL RECORDS (Hall and Cockrum, 1953:390). —British Columbia: type locality; Stikine River at Flood Glacier. Alaska: Bradfield Canal; Helm Bay.

Clethrionomys gapperi solus Hall and Cockrum

1952. *Clethrionomys gapperi solus* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:304, November 17, type from Loring, Revillagigedo Island, Alaska.

MARGINAL RECORDS (Hall and Cockrum, 1953:391). —Alaska (Revillagigedo Island): type locality; mouth of Fish Creek, Ketchikan.

Clethrionomys gapperi uintaensis Doutt

1941. *Clethrionomys gapperi uintaensis* Doutt, Proc. Biol. Soc. Washington, 54:161, December 8, type from Paradise Park, 10,050 ft., Uintah Co., Utah.

MARGINAL RECORDS (Hall and Cockrum, 1953:391, unless otherwise noted).—Utah: Monte Cristo, 18 mi. W Woodruff, 8000 ft. Wyoming: 9 mi. S Robertson. Utah: Beaver Dams, 10,500 ft.; *15 mi. E Ephraim* (Durrant, *et al.*, 1955:76); summit, 18 mi. E Mayfield (*ibid.*); Bald Peak, Uinta Mts., 10,500 ft.; Silver Lake P.O. (Brighton), 9500 ft.; *Emigration Canyon, 8 mi. above forks, 6000 ft.*

Clethrionomys gapperi ungava (V. Bailey)

1897. *Evotomys ungava* V. Bailey, Proc. Biol. Soc. Washington, 11:130, May 13, type from Fort Chimo, Quebec.
1939. *Clethrionomys gapperi ungava,* Anderson, Ann. Rept. Provancher Soc. Nat. Hist. Canada, for 1938, p. 83, February 28.

MARGINAL RECORDS.—Quebec: Payne Lake, lat. 59° 30′ N, long. 74° W (Banfield, 1956:99); type locality; Lower Seal Lake (Hall and Cockrum, 1953:391).

Clethrionomys gapperi wrangeli (V. Bailey)

1897. *Evotomys wrangeli* V. Bailey, Proc. Biol. Soc. Washington, 11:120, May 13, type from Wrangell, Wrangell Island, Alaska.
1952. *Clethrionomys gapperi wrangeli,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:303, November 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:391). —Alaska: Sergief Island; type locality.

Clethrionomys occidentalis
Western Red-backed Mouse

External measurements: 121–165; 34–53; 18–21; 10–13. Upper parts usually somber; dorsal stripe usually not well defined but rather obscured by intermixed black hairs, and varying from light hazel to deep chestnut; sides light to dark-buffy gray; venter having buffy or ochraceous wash over dark or plumbeous underfur; tail varying from indistinctly to sharply bicolor, dusky to sooty above, whitish below. Tail slender, and with short hairs except at tip where they are long.

Postpalatal bridge complete even in half-grown young with result that posterior margin of palate

forms solid shelf with median, posteriorly directed spine; dentition relatively heavy; enamel patterns of M3 and m1 simplified as compared with those of *C. gapperi* (number of salient and re-entrant angles tend to be reduced in adults).

The numbers of young in three litters born in captivity were 3, 3, and 4. MacNab and Dirks (1941: 177) reported two females, one with two and one with four embryos.

Traps set crosswise of mouse-trails under logs, or traps set close to the junction of the log and the ground, often capture mice of this species.

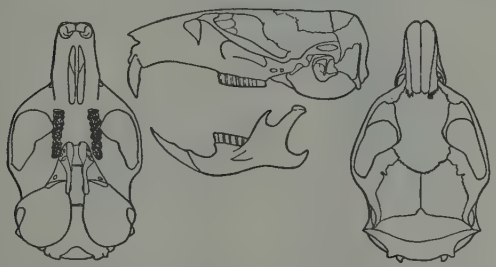


Fig. 394. *Clethrionomys occidentalis obscurus,* head Doggett Creek, 5800 ft., Siskiyou Mts., Siskiyou Co., California, No. 69490 M.V.Z., ♀, X 1½.

Clethrionomys occidentalis californicus (Merriam)

1890. *Evotomys californicus* Merriam, N. Amer. Fauna, 4:26, October 8, type from Eureka, Humboldt Co., California.
1952. *Clethrionomys occidentalis californicus,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:301, November 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:393). —Oregon: Astoria; Camp Millard, near Estacada; Wells. California: near Fair Oaks; *Willits*; 7 mi. W Cazadero, thence north along coast to point of beginning.

Clethrionomys occidentalis caurinus (V. Bailey)

1898. *Evotomys caurinus* V. Bailey, Proc. Biol. Soc. Washington, 12:21, January 27, type from Lund, east shore of Malaspina Inlet, British Columbia.
1952. *Clethrionomys occidentalis caurinus,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:299, November 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:393). —British Columbia: Inverness, mouth of Skeena River; Kutze Inlet; Kimsquit; Stuie; Alta Lake; Chilliwack Valley; type locality. Cowan and Guiguet (1956:205) refer the subspecies *caurinus* to the species *gapperi* and refer specimens from Alta Lake to *C. g. cascadensis.*

Clethrionomys occidentalis mazama (Merriam)

1897. *Evotomys mazama* Merriam, Proc. Biol. Soc. Washington, 11:71, April 21, type from Crater Lake, 7000 ft., Mt. Mazama, Oregon.
1952. *Clethrionomys occidentalis mazama,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:301, November 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:393). —Oregon: Mt. Hood; The Three Sisters; type locality. California: Mt. Shasta; vicinity Lassen Peak; near Quincy.

Map 402. *Clethrionomys occidentalis.*

1. *C. o. californicus*
2. *C. o. caurinus*
3. *C. o. mazama*
4. *C. o. nivarius*
5. *C. o. obscurus*
6. *C. o. occidentalis*

Clethrionomys occidentalis nivarius (V. Bailey)

1897. *Evotomys nivarius* V. Bailey, Proc. Biol. Soc. Washington, 11:136, May 13, type from NW slope Mt. Ellinor, 4000 ft., Olympic Mts., Washington.
1952. *Clethrionomys occidentalis nivarius,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:300, November 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:393). —Washington: Lake Sutherland; Staircase, on Lake Cushman; Sol Duc Hot Springs.

Clethrionomys occidentalis obscurus (Merriam)

1897. *Evotomys obscurus* Merriam, Proc. Biol. Soc. Washington, 11:72, April 21, type from Prospect, 2600 ft., Upper Rogue River Valley, Oregon.

1952. *Clethrionomys occidentalis obscurus*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:302, November 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:393).—Oregon: W base Mt. Jefferson; W side Crater Lake. California: Castle Lake; 2 mi. S South Yolla Bolly Mtn.; Jackson Lake. Oregon: Grants Pass.

Clethrionomys occidentalis occidentalis (Merriam)

1890. *Evotomys occidentalis* Merriam, N. Amer. Fauna, 4: 25, October 8, type from Aberdeen, Grays Harbor Co., Washington.
1952. *Clethrionomys occidentalis occidentalis*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:301, November 17.
1894. *Evotomys pygmaeus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46: 284, October 23, type from mouth Nisqually River, Pierce Co., Washington.

MARGINAL RECORDS.—British Columbia: Point Grey (Cowan and Guiguet, 1956:208). Washington (Hall and Cockrum, 1953:394): Lake Whatcom; Cottage Lake; Steilacoom; 15 mi. N Carson; Ilwaco; Ozette Lake; near Shelton.

Genus **Phenacomys** Merriam—Heather Vole and Tree Mice

Revised by A. B. Howell, N. Amer. Fauna, 48:iv + 66, 7 pls., 11 figs., October 12, 1926.

1889. *Phenacomys* Merriam, N. Amer. Fauna, 2:28, October 30. Type, *Phenacomys intermedius* Merriam.
1915. *Arborimus* Taylor, Proc. California Acad. Sci., ser. 4, 5:119, December 30. Type, *Phenacomys longicaudus* True.

External measurements: 130–193; 26–87; 16–22. Basal length, 22.3–25.7; zygomatic breadth, 13.9–16.3. Upper parts gray to cinnamon. Mammae usually 8(4p., 4i.); plantar pads 6. Temporal ridges widely separated in adult skull; bullae of medium size, without internal spongy tissue; palate neither transversely continuous nor shelflike; cheek-teeth rooted in adults; enamel pattern of lower molars unique, chiefly in depth of re-entrant angles, as compared with the external angles.

KEY TO SPECIES OF PHENACOMYS

1. Tail less than 50 mm. . . *P. intermedius*, p. 718
1′. Tail more than 50 mm.
  2. Incisors strongly recurved (see Fig. 397); tail thick, quite hairy; arboreal.
    3. Color reddish; braincase relatively unridged; nose not sooty. *P. longicaudus*, p. 721
    3′. Color brownish; braincase strongly ridged; nose sooty. . *P. silvicola*, p. 721
  2′. Incisors not strongly recurved (see Fig. 396); tail slender, scantily haired; terrestrial. . . . . *P. albipes*, p. 720

Phenacomys intermedius Heather Vole

External measurements: 130–153; 26–41; 16–18.2; 11–17; weight, up to 40.8 grams. Upper parts agouti gray to brownish but face, in some subspecies, yellowish; underparts whitish; tail sharply bicolored. Embryos, in three females from Wyoming, numbered 3, 4, and 8.

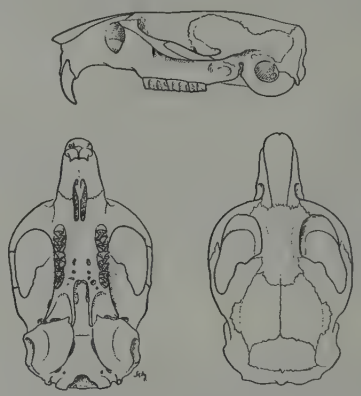


Fig. 395. *Phenacomys intermedius celsus*, Humphreys Basin, 10,800 ft., Sierra Nevada, Fresno Co., California, No. 41125 M.V.Z., ♂, X 1½.

Phenacomys intermedius celatus Merriam

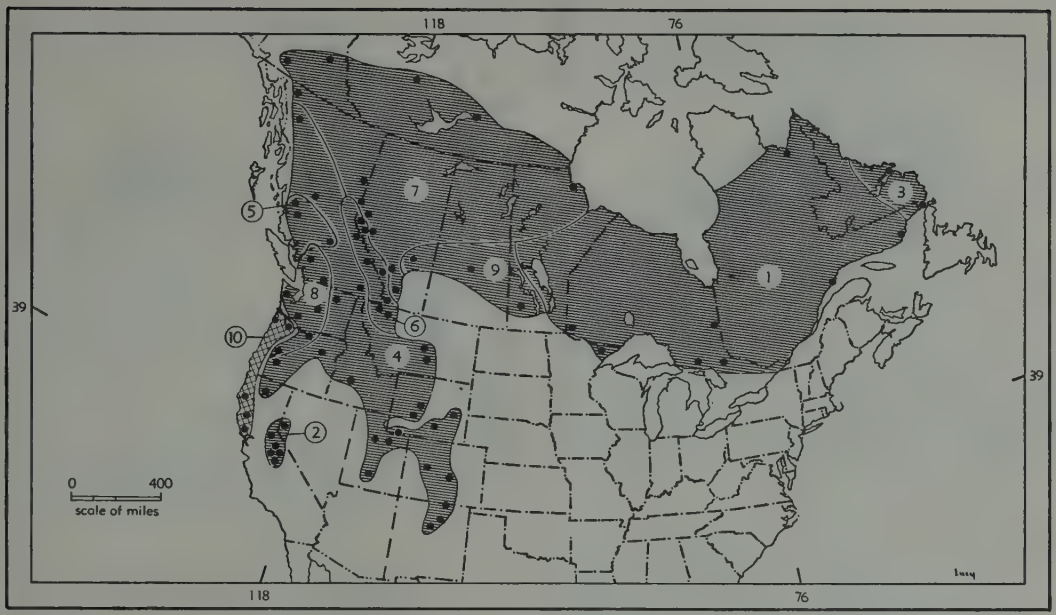
1889. *Phenacomys celatus* Merriam, N. Amer. Fauna, 2:33, October 30, type from Godbout, Quebec.
1953. *Phenacomys intermedius celatus*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:395, January 15.
1889. *Phenacomys latimanus* Merriam, N. Amer. Fauna, 2:34, October 30, type from Fort Chimo, Quebec.
1889. *Phenacomys ungava* Merriam, N. Amer. Fauna, 2:35, October 30, type from Fort Chimo, Quebec. (This name selected to apply to the subspecies by Miller, Proc. Biol. Soc. Washington, 11:84, April 21, 1897, and was used by Howell (N. Amer. Fauna, 48:25, October 12, 1926) who revised the members of the genus *Phenacomys*.)

MARGINAL RECORDS (Hall and Cockrum, 1953:396, unless otherwise noted).—Quebec: Fort Chimo, Harrington Harbor; type locality. Ontario: Nipissing; Algoma. Minnesota: Ely (Handley, 1954:260). Ontario: Kenora; Lake Abitibi.

Phenacomys intermedius celsus A. B. Howell

1923. *Phenacomys intermedius celsus* A. B. Howell, Proc. Biol. Soc. Washington, 36:158, May 1, type from Muir Meadow, 9300 ft., Tuolumne Meadows, Yosemite National Park, California.

MARGINAL RECORDS.—Nevada: ½ mi. S Grass Lake (Johnson, 1954:578). California (Hall and Cockrum, 1953: 396): Ten Lakes, Yosemite Park; Mt. Lyell; Humphreys Basin; Fletcher Creek, Yosemite Park; Pyramid Peak.



Map 403. *Phenacomys intermedius* and *Phenacomys longicaudus*.

Guide to kinds
1. *P. intermedius celatus*
2. *P. intermedius celsus*
3. *P. intermedius crassus*
4. *P. intermedius intermedius*
5. *P. intermedius laingi*
6. *P. intermedius levis*
7. *P. intermedius mackenzii*
8. *P. intermedius oramontis*
9. *P. intermedius soperi*
10. *P. longicaudus*

Phenacomys intermedius crassus Bangs

1900. *Phenacomys celatus crassus* Bangs, Proc. New England Zool. Club, 2:39, September 20, type from Rigolet, Hamilton Inlet, Labrador.
1943. *Phenacomys intermedius crassus*, Crowe, Bull. Amer. Mus. Nat. Hist., 80:404, February 4.

MARGINAL RECORDS (Hall and Cockrum, 1953:397). —Labrador: type locality; L'Anse au Loup, Strait of Belle Isle.

Phenacomys intermedius intermedius Merriam

1889. *Phenacomys intermedius* Merriam, N. Amer. Fauna, 2:32, October 30, type from a basaltic plateau, 5500 ft., about 20 mi. NNW Kamloops, British Columbia.
1891. *Phenacomys orophilus* Merriam, N. Amer. Fauna, 5:65, July 30, type from near head of Timber Creek, Lemhi Mts. [= "Salmon River Mountains"], Lemhi Co., Idaho.
1894. *Phenacomys truei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:331, November 7, type from Black Hills, now Laramie Mts., Wyoming.
1897. *Phenacomys preblei* Merriam, Proc. Biol. Soc. Washington, 11:45, March 16, type from side of Twin Peak, 9000 ft., near Longs Peak, Boulder Co., Colorado.
1899. *Phenacomys constablei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 12:4, March 4, type from Telegraph Creek, British Columbia.

MARGINAL RECORDS (Hall and Cockrum, 1953:397, unless otherwise noted).—British Columbia: Telegraph Creek; Nelson. Montana: Big Snowy Mts.; Bear Tooth Mts. Wyoming: 18 mi. W, 3 mi. N Lander; Merna; 11½ mi. S, 2 mi. E Robertson, 9200 ft.; Bridgers Pass, 18 mi. SW Rawlins, 7500 ft.; Laramie Mts. Colorado: Lake Moraine. New Mexico: Twining; Pecos Baldy; Santa Fe. Colorado: Sacramento Gulch. Utah: Provo River, 3 mi. N Soapstone G. S., Wasatch National Forest; Spectacle Lake (Durrant, *et al.*, 1955:77); Mt. Timpanogos, 10,200 ft. Idaho: Sawtooth City. Oregon: Blue Mts. California: Mt. Shasta. Oregon: Diamond Lake. Washington: Loomis [Okanagan Co.]. British Columbia: Wistaria, near Burns Lake.

Phenacomys intermedius laingi Anderson

1942. *Phenacomys intermedius laingi* Anderson, Canadian Field-Nat., 56:59, June 8, type from Kimsquit River, Cornice Creek, near head of Dean Inlet, 52° 54′ N and 127° W, 2500 ft., British Columbia.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:211): *head Eutsuk Lake*; Lac la Hache; Atnarko River; type locality.

Phenacomys intermedius levis A. B. Howell

1923. *Phenacomys intermedius levis* A. B. Howell, Proc. Biol. Soc. Washington, 36:157, May 1, type from Saint Marys Lake, Glacier Co., Montana.

MARGINAL RECORDS (Hall and Cockrum, 1953:397).—Alberta: head of Smoky River; Thoral Creek, 6000 ft.; Braggs Creek; Waterton Lakes National Park. Montana: Midvale; *Summit*; Kintla Lake. British Columbia: Assiniboine, 7500 ft.; Moose River.

Phenacomys intermedius mackenzii Preble

1902. *Phenacomys mackenzii* Preble, Proc. Biol. Soc. Washington, 15:182, August 6, type from Fort Smith, Slave River, Mackenzie.
1943. *Phenacomys intermedius mackenzii*, Crowe, Bull. Amer. Mus. Nat. Hist., 80:403, February 4.

MARGINAL RECORDS (Hall and Cockrum, 1953:398, unless otherwise noted).—Mackenzie: Lake St. Croix; Fort Reliance. Manitoba: Churchill. Alberta: Mud Lake near Macleod; *Maycroft, 4700 ft.*; Bearberry Creek, W of Olds; Entrance, 3000 ft.; Muskeg Creek. British Columbia: Tupper Creek (Cowan and Guiguet, 1956:212); Charlie Lake; Atlin. Yukon: SE end Dezadeash Lake; Lapie Lakes, Canol Road; *Lapie River, Canol Road.*

Phenacomys intermedius oramontis Rhoads

1895. *Phenacomys oramontis* Rhoads, Amer. Nat., 29:941, October, type from Church Mtn. (Lihumitson Mtn.), 6000 ft., Lihumitson Park, Mt. Baker Range, New Westminster District, British Columbia.
1942. *Phenacomys intermedius oramontis*, Anderson, Canadian Field-Nat., 56:59, June 8.
1899. *Phenacomys olympicus* Elliot, Field Columb. Mus., Publ. 30, Zool. Ser., 1:225, February 2, type from Happy Lake, 5000 ft., Olympic Mts., Clallam Co., Washington. Anderson (Canadian Field-Nat., 56:59, June 8, 1942) considers *P. olympicus* to be a synonym of *P. i. oramontis* Rhoads.
1899. *Microtus* (*Lagurus*) *pumilus* Elliot, Field Columb. Mus., Publ. 30, Zool. Ser., 1:226, February 2, type from Happy Lake, Olympic Mts., Clallam Co., Washington. Dalquest (Univ. Kansas Publ., Mus. Nat. Hist., 2:340, April 9, 1948) considers *M. pumilus* to be a synonym of *P. i. oramontis* Rhoads.

MARGINAL RECORDS (Hall and Cockrum, 1953:398, unless otherwise noted).—British Columbia: Avalanche Pass, 5500 ft.; Manning Park (Cowan and Guiguet, 1956:212). Washington: near Stephens Pass. Oregon: Deschutes River; Three Sisters; *Mt. Hood.* Washington: Canyon Creek; Boulder Lake.

Phenacomys intermedius soperi Anderson

1942. *Phenacomys ungava soperi* Anderson, Canadian Field-Nat., 56:58, June 8, type from near Swanson Creek, in middle of sec. 34, T. 19, R. 17, Riding Mtn. National Park, Manitoba.
1943. *Phenacomys intermedius soperi*, Crowe, Bull. Amer. Mus. Nat. Hist., 80:404, February 4.

MARGINAL RECORDS (Hall and Cockrum, 1953:398).—Saskatchewan: Emma Lake, SE of Prince Albert National Park. Manitoba: type locality. Alberta: Battle Lake (head of Battle River).

Map 404. *Phenacomys albipes.*

Phenacomys albipes Merriam
White-footed Vole

1901. *Phenacomys albipes* Merriam, Proc. Biol. Soc. Washington, 14:125, July 19, type from Redwoods, near Arcata, Humboldt Bay, Humboldt Co., California.

Average external measurements of six adult males: 171 (165–181); 63 (62–71); 19.5 (19–20). Upper parts close to Prout's Brown, with mixture of black-tipped hairs. Underparts clear gray, often washed with pinkish buff in autumn.

MARGINAL RECORDS (Hall and Cockrum, 1953:398, unless otherwise noted).—Oregon: Old Fort Clatsop (*op. cit.*:401); Netarts; Vida. California: type locality.

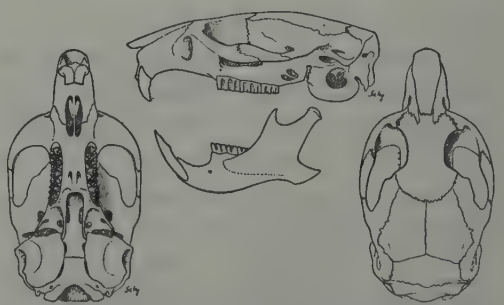
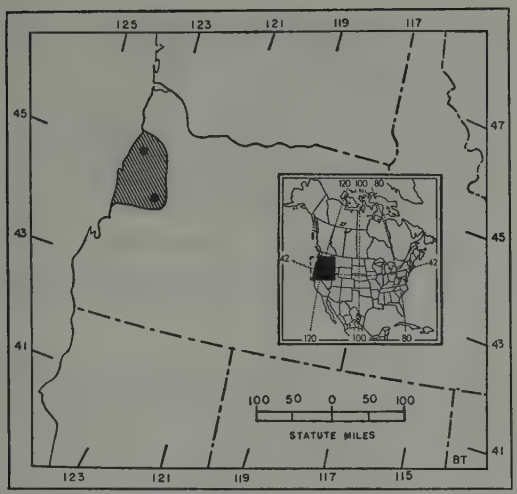


Fig. 396. *Phenacomys albipes*, Old Fort Clatsop, 100 ft., Clatsop Co., Oregon, No. 94499 M.V.Z., ♀, X 1⅛.



Map 405. *Phenacomys silvicola.*

Phenacomys silvicola A. B. Howell
Dusky Tree Mouse

1921. *Phenacomys silvicolus* A. B. Howell, Jour. Mamm., 2:98, May 2, type from 5 mi. SE Tillamook, Tillamook Co., Oregon.

External measurements of one male and one female are: 193, 191; 87, 81; 20, 22. Upper parts near cinnamon brown, with a sooty nose; underparts whitish. Tail long and well haired. Wight (1925: 283) recorded 4 young associated with one female.

MARGINAL RECORDS (Hall and Cockrum, 1953:399, 401).—Oregon: *Netarts*; 3 or 4 mi. W Tillamook; *type locality*; near Corvallis.

Fig. 397. *Phenacomys silvicola,* Netarts, Tillamook Co., Oregon, No. 61411 M.V.Z., sex ?, X 1⅛.

Phenacomys longicaudus True
Red Tree Mouse

1890. *Phenacomys longicaudus* True, Proc. U. S. Nat. Mus., 13:303, November 15, type from Marshfield, Coos Co., Oregon.

External measurements of six adult males and five adult females: 166 (158–176), 182 (170–187); 67 (60–72), 73 (66–83); 20 (19–21), 21 (21–22). Upper parts uniform cinnamon, near ochraceous tawny with many hairs sparingly tipped with black; underparts whitish; tail long, blackish, and well haired. Benson and Borell (1931:228) record one female with three embryos and two other females each associated with two young.

MARGINAL RECORDS (Hall and Cockrum, 1953:399–401).—Oregon: Nehalem; Bonneville. California: 1 mi. W Bridgeville; Mt. Sanhedrin; 1 mi. S of Occidental, thence north along coast to point of beginning.

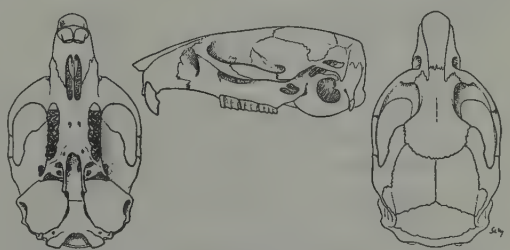


Fig. 398. *Phenacomys longicaudus,* 1 mi. S Occidental, Sonoma Co., California, No. 94761 M.V.Z., ♀, X 1⅛.

Genus Microtus Schrank—Meadow Voles

North American species revised by V. Bailey, N. Amer. Fauna, 17:1–88, 5 pls., 17 figs., June 6, 1900.

1798. *Microtus* Schrank, Fauna Boica . . . , 1(Abth. 1): 72. Type, *Microtus terrestris* Schrank [= *Mus arvalis* Pallas].

1817. *Mynomes* Rafinesque, Amer. Monthly Mag., 2:45. Type, *Mynomes pratensis* Rafinesque [= *Mus pennsylvanica* Ord].

1830. *Psammomys* Le Conte, Ann. Lyc. Nat. Hist., New York, 3:132 (for 1829). Type, *Psammomys pinetorum* Le Conte. Not *Psammomys* Cretzschmar, 1828.

1831. *Pitymys* McMurtrie, The Animal Kingdom . . . by the Baron Cuvier . . . American ed., 1:434. Type, *Psammomys pinetorum* Le Conte.

1831. *Ammomys* Bonaparte, Saggio di una distribuzione methodica degli animali vertebrati, p. 20. Type, *Psammomys pinetorum* Le Conte.
1836. *Hemoitomys* de Sélys-Longchamps, Essai monograph. sur les campagnols des environs de Leige, p. 7. Included *fulvus* [= *Mus arvalis* Pallas] and *amphibius* [= *Mus terrestris* Linnaeus (= *Arvicola terrestris* of authors)].
1849. *Neodon* Hodgson, Ann. Mag. Nat. Hist., ser. 1, 3:203. Type, *Neodon sikimensis* Hodgson.
1857. *Agricola* Blasius, Fauna der Wirbelthiere Deutschlands, Säugethiere, p. 334. Type, *Mus agrestis* Linnaeus.
1858. *Chilotus* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):516, July 14. Type, *Arvicola oregoni* Bachman.
1858. *Pedomys* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):517, July 14. Type, *Arvicola austerus* Le Conte [= *Hypudaeus ochrogaster* Wagner].
1863. *Phaiomys* Blyth, Jour. Asiatic Soc. Bengal, 32, 1:89. Type, *Phaiomys leucurus* Blyth.
1887. *Lasiopodomys* Lataste, Ann. Mus. Civ. Stor. Nat. Genova, 2a, 4:268. Type, *Arvicola brandti* Radde.
1890. *Campicola* Schulze, Schriften Naturw. Vereins d. Harzes in Wernigerode, 5:24. Contained *arvalis* and *agrestis* according to Ellerman and Morrison-Scott, Checklist of Palaearctic and Indian mammals. . . . British Museum (Nat. History), p. 690, November 19, 1951.
1894. *Tetramerodon* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, p. 282, Oct. 23. Type, *Arvicola tetramerus* Rhoads.
1894. *Aulacomys* Rhoads, Amer. Nat., 28:182, February. Type, *Aulacomys arviculoides* Rhoads.
1898. *Orthriomys* Merriam, Proc. Biol. Soc. Washington, 12:106, April 30. Type, *Microtus umbrosus* Merriam.
1898. *Herpetomys* Merriam, Proc. Biol. Soc. Washington, 12:107, April 30. Type, *Microtus guatemalensis* Merriam.
1899. *Euarvicola* Aeloque, Faune de France, Mammals, p. 49. Type, *Mus agrestis* Linnaeus.
1901. *Stenocranius* Kastschenko, Ann. Mus. St. Petersborg, 6:167. Type, *Microtus slowzowi* Poljakoff.
1908. *Chinomys* Miller, Ann. Mag. Nat. Hist., ser. 8, 1:97. Type, *Arvicola nivalis* Martins.
1911. *Proedromys* Thomas, Proc. Zool. Soc. London, p. 177, March 22. Type *Proedromys bedfordi* Thomas.
1914. *Alexandromys* Ognev, Moskva Dnev. Zool. otd. obsc. liub. jest., 2:109. Type, *Microtus pelliceus* Thomas.
1919. *Abusticola* Shidlovsky, Tiflis Bull. Terr. Exper. Stat., 2:21. Type, *Microtus rubelianus* Shidlovsky [= *Microtus* (*Pitymys*) *majori* Thomas].
1933. *Sumeriomys* Argyropulo, Zeitschr. Säugetier., 8:180. Type, *Mus socialis* Pallas.
1941. *Lemmimicrotus* Tokuda, Trans. Biogeog. Soc. Japan, 4(1):68, December. Type, *Arvicola mandarinus* Milne-Edwards.

External measurements: 101–261; 15–93; 13–30. Basal length, 19.3–36.0; zygomatic breadth, 10.7–23.0. Pelage usually long and loose; tail usually less than half as long as head and body, but not excessively reduced; ears short and rounded and nearly concealed by pelage. Mammae usually 2–2 =8 (exceptions: 1–1 = 4, *mexicanus* group; 1–2 = 6, subgenus *Pedomys*; 2–0 = 4, subgenus *Orthriomys*; and 2–1 = 6, subgenus *Herpetomys*). Lower incisors with roots extending far behind, and on outer side of, molar series; upper incisors not grooved; molars rootless, with outer and inner re-entrant angles approximately equal; the pattern, a series of loops and triangles of enamel surrounding areas of dentine, varies somewhat with the species.

KEY TO NORTH AMERICAN SPECIES OF MICROTUS

1. Last lower molar (m3) with 2 transverse loops and 2 median triangles; plantar tubercles 5.
   2. Last upper molar (M3) with 3 triangles; mammae 6; tail less than 46% of total length. (Subgenus *Herpetomys*) *M. guatemalensis*, p. 747
   2′. Last upper molar (M3) with 2 closed triangles; mammae 4; tail more than 46% of total length. (Subgenus *Orthriomys*) *M. umbrosus*, p. 747
1′. Last lower molar (m3) with 3 transverse loops and no closed triangles; plantar tubercles 5 or 6.
   3. M3 with 3 closed triangles (except: *M. breweri* with 2 usually confluent; *M. chrotorrhinus* with 5 closed); mammae 8 (except in *M. mexicanus*, which has 4).
      4. Plantar tubercles 5; side glands either on flanks or inconspicuous.
         5. Side glands conspicuous on flanks of adult males; external measurements more than 176, 55, 22. . . . . (Subgenus *Aulacomys*) *M. richardsoni*, p. 743
         5′. Side glands obscure or wanting; external measurements less than 176, 55, 22. (Subgenus *Chilotus*) *M. oregoni*, p. 744
      4′. Plantar tubercles 6; side glands on hips in adult males (on flanks in *M. xanthognathus*).
         6. Skull narrow as in Fig. 70 and with pronounced median crest; claws enlarged. (Subgenus *Stenocranius*).
            7. Hind foot more than 21.5; confined to Hall Island and St. Matthew Island in Bering Sea. *M. abbreviatus*, p. 747
            7′. Hind foot less than 21.5; not on Hall and St. Matthew islands but instead on mainland of North America. . . . . *M. miurus*, p. 745
         6′. Skull not so narrow as in Fig. 70 and without pronounced median crest; claws not enlarged. (Subgenus *Microtus*).
            8. M2 with 4 closed angular sections and a rounded posterior loop.
               9. M3 with 2 of the 3 triangles usually confluent; insular species.

10. Interparietal approximately as wide as long; pale (upper parts buffy gray); confined to Muskeget Island, Mass. . . . . *M. breweri*, p. 728
10′. Interparietal notably wider than long; dark (upper parts dark yellowish bister); confined to Great Gull Island and Little Gull Island, New York. . . . . *M. nesophilus*, p. 728
9′. M3 with 3 closed triangles. . . . . *M. pennsylvanicus*, p. 724
8′. M2 with 4 closed angular sections and no posterior loop (except irregularly in *M. californicus*).
11. Mammae 4 (inguinal, 1-1; pectoral, 1-1); skull short and wide with incisive foramina not constricted (see Fig. 83).
12. Colors dull brownish or even grayish above and below; north of Oaxaca. *M. mexicanus*, p. 739
12′. Colors bright rich brown above and below; known only from Oaxaca. . *M. fulviventer*, p. 741
11′. Mammae 8 (inguinal, 2-2; pectoral, 2-2). Skull short or wide with foramina constricted or unconstricted (see figures of skulls).
13. m1 with 4 closed triangles (5 in some *M. o. sitkensis*) and rounded anterior loop. *M. oeconomus*, p. 735
13′. m1 with 5 or 6 closed triangles.
14. A pair of glands on flanks of males; nose yellowish.
15. Hind foot more than 23.5; side glands conspicuous in adult males; M3 with 3 closed triangles. . . . . *M. xanthognathus*, p. 741
15′. Hind foot less than 23.5; glands obscure or wanting; M3 with 5 closed triangles. *M. chrotorrhinus*, p. 741
14′. A pair of glands on hips of males; nose not yellowish.
16. Incisive foramina gradually tapered posteriorly (not abruptly constricted) or not constricted posteriorly (see Figs. 401 and 404).
17. Tail averaging ⅓ or more of total length; skull without prominent ridging and with incisive foramina open and not constricted posteriorly, or if constricted only gradually tapered (see Fig. 404); not confined to Oregon and California and not in Baja California.
18. On Forester, Coronation and Warren islands of SE Alaska. *M. coronarius*, p. 739
18′. Not on Forester, Coronation and Warren islands of SE Alaska. *M. longicaudus*, p. 737
17′. Tail averaging less than ⅓ of total length; skull prominently ridged and with incisive foramina wide open and not constricted posteriorly (see Fig. 401); confined to Oregon, California and Baja California. . . *M. californicus*, p. 731
16′. Incisive foramina abruptly constricted and narrower posteriorly than anteriorly (see Figs. 400 and 402).
19. Confined to Pacific coastal area west of crest of Cascade Mts., from Fraser River of extreme SW British Columbia south to 40° lat. in California; upper parts dark brown to blackish; hind foot more than 23.7. . . *M. townsendii*, p. 733
19′. Not confined to Pacific coastal area, but *in the region occupied by M. townsendii* upper parts yellowish or grayish and hind foot less than 23.7. *M. montanus*, p. 728
3′. M3 with 2 closed triangles; mammae 4 or 6.
20. Mammae 4; fur short, fine, molelike, reddish on upper parts; tail less than 26 mm. (Subgenus *Pitymys*).
21. Hind foot of adults less than 16; upper parts pale (near tawny); geographical range Florida and extreme southern Georgia. . . . . *M. parvulus*, p. 751
21′. Hind foot of adults more than 16; upper parts dark (russet brown or darker); geographical range not including Florida and extreme southern Georgia.
22. Ear from notch usually more than 12.5; upper parts dark (near dark umber); occurs in mountains of eastern México. . . . . *M. quasiater*, p. 751
22′. Ear from notch usually less than 12.5; upper parts pale (bright russet brown to brownish chestnut); occurs in eastern and central North America north of México. *M. pinetorum*, p. 750
20′. Mammae 6; fur long, coarse, mouselike, grayish as opposed to reddish on upper parts; tail more than 26 mm. in areas where subgenera *Pitymys* and *Pedomys* occur together (Subgenus *Pedomys*).
23. Occurs in southeastern Texas and Louisiana. . . . . *M. ludovicianus*, p. 749
23′. Occurs north of Louisiana. . . . . *M. ochrogaster*, p. 748

Subgenus Microtus Schrank

1798. *Microtus* Schrank, Fauna Boica, 1(Abth. 1):72. Type, *Microtus terrestris* Schrank [= *Mus arvalis* Pallas].

Plantar tubercles 6; lateral glands on hips in adult males; m1 with 5 closed triangles; m3 with 3 transverse loops and no triangles; M2 with 4 closed sections, and in most eastern species an additional posterior inner loop; M3 with 3 closed triangles (except in *M. chrotorrhinus*).

Microtus pennsylvanicus
Meadow Vole

Total length, 140–195; tail, 33–64; hindfoot, 18–24; ear, 12–16. Body 2.0 to 3.1 times as long as tail; tail 1.9 to 2.7 times as long as hind foot. Color of pelage varies according to subspecies; in general, upper parts varying from bright yellowish chestnut to dull bister that is much obscured by black-tipped hairs; northern subspecies generally reddish and southern subspecies generally more blackish or grayish; underparts usually some shade of gray washed with whitish or buffy. Middle upper molar with fifth posterior loop; incisive foramina long and not constricted posteriorly; Ellerman (1941:590) indicated that this species and the Old World *M. agrestis* are closely related; in fact Ellerman and Morrison-Scott (1951:702) suggest that *M. agrestis* and *M. pennsylvanicus* are conspecific when they state that *M. agrestis* occurs "Doubtless also in much of North America."

Microtus pennsylvanicus has the largest geographic range in North America of any species of the subgenus *Microtus*, and for that matter it has the largest geographic range of any American species in the genus *Microtus*. Like most, and probably all, species of microtine rodents, *Microtus pennsylvanicus* fluctuates markedly in numbers.

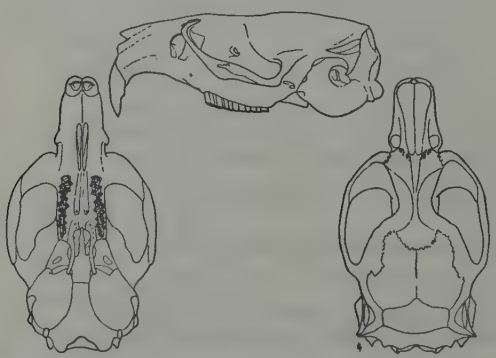


Fig. 399. *Microtus pennsylvanicus pullatus*, 17 mi. E and 4 mi. N Ashton, 6275 ft., Fremont Co., Idaho, No. 89191 M.V.Z., ♂, X 1½.

Microtus pennsylvanicus acadicus Bangs

1897. *Microtus pennsylvanicus acadicus* Bangs, Amer. Nat., 31:239, March, type from Digby, Nova Scotia.

MARGINAL RECORDS (Hall and Cockrum, 1953:406).—Nova Scotia: Victoria County; Guysborough County; Shelburne County. New Brunswick: Grand Manan. Nova Scotia: Kings County. Prince Edward Island: Mt. Herbert.

Microtus pennsylvanicus admiraltiae Heller

1909. *Microtus admiraltiae* Heller, Univ. California Publ. Zool., 5:256, February 18, type from Windfall Harbor, Admiralty Island, Alaska.
1933. *Microtus pennsylvanicus admiraltiae*, Swarth, Proc. Biol. Soc. Washington, 46:208, October 26.

MARGINAL RECORDS (Hall and Cockrum, 1953:406).—Alaska: *Hawk Inlet*; type locality; *Mole Harbor; lake west of Mole Harbor.*

Microtus pennsylvanicus alcorni Baker

1951. *Microtus pennsylvanicus alcorni* Baker, Univ. Kansas Publ., Mus. Nat. Hist., 5:105, November 28, type from 6 mi. SW Kluane, 2550 ft., Yukon.

MARGINAL RECORDS (Hall and Cockrum, 1953:407, unless otherwise noted).—Alaska: E side Deadman Lake, 1800 ft., 15 mi. SE Northway. Yukon: type locality. Alaska: E side Chilkat River, 100 ft., 9 mi. W, 4 mi. N Haines; *S shore Naknek Lake* (Schiller and Rausch, 1956:198); Nushagak; Kakhtul River, near junction with Malchatna; *Skwentna* (Schiller and Rausch, 1956:198); Tyonek, Cook Inlet; 1 mi. NE Anchorage, 100 ft.

Microtus pennsylvanicus aphorodemus Preble

1902. *Microtus aphorodemus* Preble, N. Amer. Fauna, 22: 52, October 31, type from barren grounds about 50 mi. S Cape Eskimo, near mouth Thlewiaza River, Keewatin.
1937. *Microtus pennsylvanicus aphorodemus*, Anderson, *in* Canada's Western Northland (Mammals), Dept. Interior, Ottawa, p. 112, July 9.

MARGINAL RECORDS (Hall and Cockrum, 1953:408).—Keewatin: type locality. Manitoba: Churchill.

Microtus pennsylvanicus arcticus Cowan

1951. *Microtus pennsylvanicus arcticus* Cowan, Jour. Mamm., 32:353, August 23, type from Kidluit Bay, northeast corner of Richards Island, lat. 69° 31′ N, long. 133° 49′ W, Mackenzie. Known only from the type locality.

Microtus pennsylvanicus aztecus (J. A. Allen)

1893. *Arvicola* (*Mynomes*) *aztecus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:73, April 28, type from Aztec, 5900 ft., San Juan Co., New Mexico.
1952. *Microtus pennsylvanicus aztecus*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:307, November 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:408).—New Mex.: Laplata; *type loc.*; Farmington; *Fruitland.*

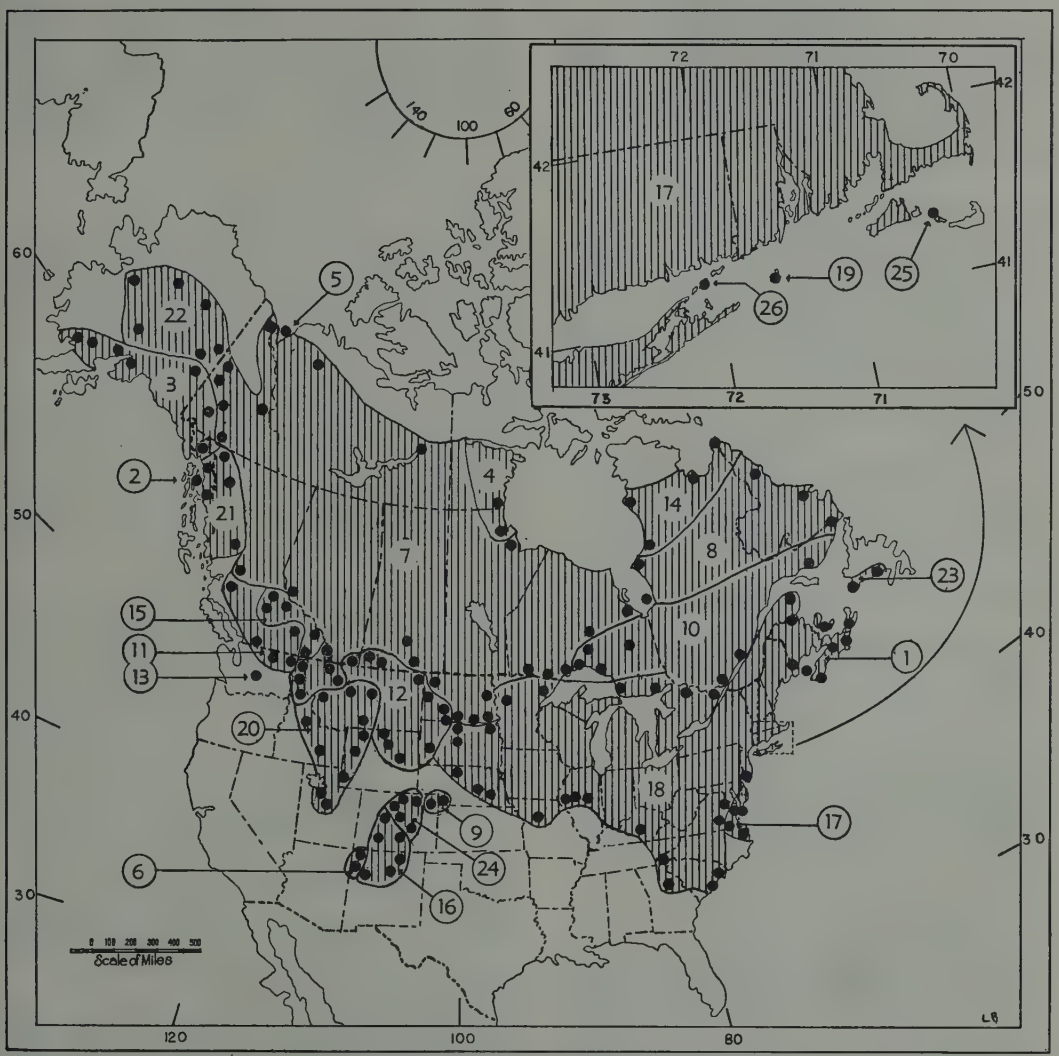
Microtus pennsylvanicus drummondii (Aud. and Bach.)

1853. *Arvicola drummondii* Audubon and Bachman, The viviparous quadrupeds of North America, 3:166, type

from "Valleys of the Rocky Mountains"; probably in the vicinity of Jasper House, Alberta.

1913. *Microtus pennsylvanicus drummondii*, Hollister, Canadian Alp. Jour., Special number, p. 23, February 17.

1899. *Microtus stonei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 12:5, March 4, type from Liard River, British Columbia. See J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:550, who points out valid characters of this subspecies.



Map 406. *Microtus pennsylvanicus* and two allied species.

Guide to kinds

1. *M. p. acadicus*
2. *M. p. admiraltiae*
3. *M. p. alcorni*
4. *M. p. aphorodemus*
5. *M. p. arcticus*
6. *M. p. aztecus*
7. *M. p. drummondii*
8. *M. p. enixus*
9. *M. p. finitus*
10. *M. p. fontigenus*
11. *M. p. funebris*
12. *M. p. insperatus*
13. *M. p. kincaidi*
14. *M. p. labradorius*
15. *M. p. microcephalus*
16. *M. p. modestus*
17. *M. p. nigrans*
18. *M. p. pennsylvanicus*
19. *M. p. provectus*
20. *M. p. pullatus*
21. *M. p. rubidus*
22. *M. p. tananaensis*
23. *M. p. terraenovae*
24. *M. p. uligocola*
25. *M. breweri*
26. *M. nesophilus*

MARGINAL RECORDS (Hall and Cockrum, 1953:408, unless otherwise noted).—Mackenzie: Reindeer Station; Fort Anderson; Clinton-Colden Lake. Manitoba: Herchmer. Ontario: Fort Albany; Lake Attawapiskat; Thunder Bay; Quetico Park; Rainy River. North Dakota: Portland; Lisbon; Ludden; Napoleon; Lostwood. Saskatchewan: Big Muddy Lake; Lost Mountain. Montana: St. Mary Lake; Blackfoot (S. Anderson, 1956:99). Idaho: Coeur d'Alene (*ibid.*); 5 mi. W Cocolalla; Priest Lake. British Columbia: Crows Nest Station, on Canadian Pacific Railroad, 4444 ft. Alberta: 50 mi. N Jasper House. British Columbia: Wistaria. Yukon: Caribou Crossing; Fort Selkirk; Sixty-mile Creek; Chandindu River; South Fork, Macmillan River. Mackenzie: *Aklavik*.

Microtus pennsylvanicus enixus Bangs

1896. *Microtus enixus* Bangs, Amer. Nat., 30:1051, December, type from Hamilton Inlet, Labrador.
1936. *M[icrotus]. p[ennsylvanicus]. enixus,* D. L. Davis, Jour. Mamm., 17:290, August 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:409).—Labrador: Hebron; type locality; Black Bay. Quebec: Charlton Island; near Cape Jones.

Microtus pennsylvanicus finitus S. Anderson

1956. *Microtus pennsylvanicus finitus* S. Anderson, Univ. Kansas Publ., Mus. Nat. Hist., 9:96, May 10, type from 5 mi. N, 2 mi. W Parks, Dundy Co., Nebraska.

MARGINAL RECORDS (S. Anderson, 1956:97).—Nebraska: type locality. Colorado: Wray. Nebraska: *Haigler*.

Microtus pennsylvanicus fontigenus Bangs

1896. *Microtus fontigenus* Bangs, Proc. Biol. Soc. Washington, 10:48, March 9, type from Lake Edward, Quebec. (Regarded as inseparable from *M. p. pennsylvanicus* by Weaver, Jour. Mamm., 21:420, November 14, 1940, but admitted as valid by Rand, Canadian Field-Nat., 57:119, January 24, 1944.)
1897. *Microtus pennsylvanicus fontigenus,* Miller, Proc. Boston Soc. Nat. Hist., 28:14, April 30.

MARGINAL RECORDS (Hall and Cockrum, 1953:409).—Quebec: Natashkwan; near Quebec City; Labelle County. Ontario: Rossport; Nipigon; Macdiarmid; Kapuskasing.

Microtus pennsylvanicus funebris Dale

1940. *Microtus pennsylvanicus funebris* Dale, Jour. Mamm., 21:338, August 13, type from Coldstream, 1450 ft., 3½ mi. SE Vernon, British Columbia. (Regarded by Cowan and Guiguet, Handbook No. 11, British Columbia Provincial Mus., p. 219, July 15, 1956, as inseparable from *M. p. drummondii*.)

MARGINAL RECORDS (Hall and Cockrum, 1953:409).—British Columbia: island in Anahim Lake; Okanagan Landing. Washington: Newport; Conconully. British Columbia: Princeton.

Microtus pennsylvanicus insperatus (J. A. Allen)

1894. *Arvicola insperatus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:347, December 7, type from Custer, Custer Co., South Dakota.
1943. *Microtus pennsylvanicus insperatus,* Anderson, Canadian Field-Nat., 57:92, October 17.
1920. *Microtus pennsylvanicus wahema* V. Bailey, Jour. Mamm., 1:72, March 2, type from Glendive, Dawson Co., Montana.

MARGINAL RECORDS (Hall and Cockrum, 1953:409, unless otherwise noted).—Saskatchewan: Crane Lake; Swift Current. Montana: 3 mi. S Medicine Lake City. North Dakota: 10 mi. S Williston; Bismark; mouth Cannonball River. South Dakota: type locality. Wyoming (S. Anderson, 1956:102): Newcastle; Belle Fourche River, 45 mi. S and 13 mi. W Gillette, 5350 ft.; ¼ mi. E Klondike, 5160 ft.; 3 mi. WNW Monarch [= Kleeburn]. Alberta: Milk River.

Microtus pennsylvanicus kincaidi Dalquest

1941. *Microtus montanus kincaidi* Dalquest, Proc. Biol. Soc. Washington, 54:145, September 30, type from the Potholes, 10 mi. S Moses Lake, Grant Co., Washington. Known only from type locality and *Moses Lake*.
1948. *Microtus pennsylvanicus kincaidi* Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 2:347, April 9.

Microtus pennsylvanicus labradorius V. Bailey

1898. *Microtus pennsylvanicus labradorius* V. Bailey, Proc. Biol. Soc. Washington, 12:88, April 30, type from Fort Chimo, Quebec.

MARGINAL RECORDS (Hall and Cockrum, 1953:409).—Quebec: Port Burwell; Great Whale River; Port Harrison; mouth Koksoak River.

Microtus pennsylvanicus microcephalus (Rhoads)

1894. *Arvicola* (*Mynomes*) *microcephalus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:286, October 23, type from Lac LaHache, British Columbia. (Regarded as inseparable from *M. p. drummondii* by Cowan and Guiguet, Handbook No. 11, British Columbia Provincial Museum, p. 219, July 15, 1956.)
1940. *Microtus pennsylvanicus microcephalus,* Dale, Jour. Mamm., 21:337, August 14.

MARGINAL RECORDS (Hall and Cockrum, 1953:410).—British Columbia: Cottonwood P.O.; Mt. Robson, Mt. Robson Park; Field; Cranbrook; type locality.

Microtus pennsylvanicus modestus (Baird)

1858. *Arvicola modesta* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):535, July 14, type from Cochetopa [= "Sawatch"] Pass, Saguache Co., Colorado.
1900. *Microtus pennsylvanicus modestus,* V. Bailey, N. Amer. Fauna, 17:20, June 6.

MARGINAL RECORDS (S. Anderson, 1956:94, unless otherwise noted).—Colorado: Twin Lakes; Westcliffe. New Mexico: 1 mi. S and 2 mi. E Eagle Nest, 8100 ft.; [Coyote Creek, east side] Sangre de Cristo Mts. (Hall and Cockrum, 1953:410); San Raphael, near eastern point of Zuni Mts. (*ibid.*). Colorado: type locality.

Microtus pennsylvanicus nigrans Rhoads

1897. *Microtus pennsylvanicus nigrans* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 49:307, June 18, type from Currituck, Currituck Co., North Carolina.

MARGINAL RECORDS (Hall and Cockrum, 1953:410). —Virginia: Richmond County; Smiths Island. North Carolina: type locality. Virginia: Nansemond County.

Microtus pennsylvanicus pennsylvanicus (Ord)

1815. *Mus Pennsylvanica* Ord, *in* Guthrie, A new geogr., hist., comm. grammar. . . . Philadelphia, 2nd Amer. ed., 2:292, type from meadows below Philadelphia, Pennsylvania.

1895. *M[icrotus]. pennsylvanicus,* Rhoads, Amer. Nat., 29: 940, October.

1817. *Mynomes pratensis* Rafinesque, Amer. Monthly Mag., 2:45, based on Wilson's (Amer. Ornith., 6:pl. 50, fig. 3) description of the meadow vole from meadows below Philadelphia and along the seashore.

1820. *Lemmus noveboracensis* Rafinesque, Annals of Nature, p. 3, type from New York or New Jersey.

1825. *Arvicola riparius* Ord, Jour. Acad. Nat. Sci. Philadelphia, 4(2):305–306, type locality not given.

1825. *Arvicola palustris* Harlan, Fauna Americana, p. 136, type from swamps along the shores of the Delaware.

1840. *Arvicola hirsutus* Emmons, Report on the quadrupeds of Massachusetts, p. 60, type from Massachusetts.

1840. *Arvicola albo-rufescens* Emmons, Report on the quadrupeds of Massachusetts, p. 60, type from Williamstown, Massachusetts.

1841. *Arvicola fulva* Audubon and Bachman, Proc. Acad. Nat. Sci. Philadelphia, 1:96, type from "One of the Western States; we believe Illinois."

1841. *Arvicola nasuta* Audubon and Bachman, Proc. Acad. Nat. Sci. Philadelphia, 1:96–97, type from near Boston, Massachusetts.

1842. *Arvicola rufescens* DeKay, Zoology of New York . . . Mammals, 1:85, type from Oneida Lake, New York.

1842. *Arvicola oneida* DeKay, Zoology of New York . . . Mammals, 1:88–89, type from Oneida Lake, New York.

1854. *Arvicola dekayi* Audubon and Bachman, The viviparous quadrupeds of North America, 3:287–288, type from New York or Illinois.

1858. *Arvicola riparia* var. *longipilis* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):524, July 14, type from West Northfield, Illinois, or Racine, Wisconsin.

1858. *Arvicola rufidorsum* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):526, July 14, type from Holmes Hole, Marthas Vineyard, Massachusetts.

1901. *Microtus pennsilvanicus* [*sic*] *shattucki* Howe, Proc. Portland Soc. Nat. Hist., 2:201, December 31, type from Tumble Down Dick Island, near Long Island, Penobscot Bay, Maine. Regarded by Wyman (Jour. Mamm., 3:166, August 4, 1922) as inseparable from *Microtus pennsylvanicus pennsylvanicus.*

MARGINAL RECORDS (Hall and Cockrum, 1953:411, unless otherwise noted).—Quebec: Gaspé Peninsula. New Brunswick: near Bathhurst. Maine: Calais; *Tumble Down Dick Island.* Massachusetts: *Woods Hole.* New Jersey: Tuckerton. Virginia: Westmoreland County; Prince George County. South Carolina: near Santee River, Charleston Co.; Charleston. Georgia: 2 mi. N Athens. North Carolina: Highlands. Kentucky: Lexington; *Midway.* Illinois (Hoffmeister, 1954:3): Normal; Banner; Good Hope. Missouri: Saline County [presumably]. Nebraska: 5 mi. E Rising City (Jones, 1954:486); 2½ mi. N Ord (*ibid.*); Valentine. South Dakota: Pierre; Swan Creek, 1600 ft., 13 mi. S Selby; Fort Sisseton. *North Dakota* (V. Bailey, 1927:90): *Red River Valley; Lidgerwood; Larimore; Drayton.* Minnesota: Heron Lake; Tower. Ontario: Pancake Bay; Nipissing; Algonquin Park. Quebec: Ottawa.

Microtus pennsylvanicus provectus Bangs

1908. *Microtus provectus* Bangs, Proc. New England Zool. Club, 4:20, March 6, type from Block Island, Newport Co., Rhode Island. Known only from Block Island. Chamberlain (Jour. Mamm., 35:589, November 29, 1954) considers *M. provectus* to be "merely a subspecies of *M. pennsylvanicus.*"

Microtus pennsylvanicus pullatus S. Anderson

1956. *Microtus pennsylvanicus pullatus* S. Anderson, Univ. Kansas Publ., Mus. Nat. Hist., 9:97, May 10, type from 12 mi. N and 2 mi. E Sage, 6100 ft., Lincoln Co., Wyoming.

MARGINAL RECORDS (S. Anderson, 1956:99, unless otherwise noted).—Montana: Highwood Mts.; 7 mi. NE Higler; 10 mi. NW Park City. Wyoming: 3¾ mi. E, ¾ mi. S Cody, 5020 ft.; 34 mi. N and 4 mi. W Pinedale, 7950 ft.; *Kendall;* 6 mi. N and 2 mi. E Sage. Utah (Hall and Cockrum, 1953:410): 2 mi. S Provo; ½ mi. W Salt Lake Airport, U.S. Highway 40, 4200 ft. Idaho (*ibid.*): Bannock Creek, 4 mi. S Portneuf River; Challis. Montana: Florence.

Microtus pennsylvanicus rubidus Dale

1940. *Microtus pennsylvanicus rubidus* Dale, Jour. Mamm., 21:339, August 13, type from Sawmill Lake, near Telegraph Creek, British Columbia. (Regarded as inseparable from *M. p. drummondii* by Cowan and Guiguet, Handbook No. 11, British Columbia Provincial Mus., p. 219, July 15, 1956.)

MARGINAL RECORDS (Hall and Cockrum, 1953:411). —British Columbia: Atlin; type locality; Hazelton. Alaska: Fort Wrangell; Taku River.

Microtus pennsylvanicus tananaensis Baker

1951. *Microtus pennsylvanicus tananaensis* Baker, Univ. Kansas Publ., Mus. Nat. Hist., 5:107, November 28, type from Yerrick Creek, 21 mi. W, 4 mi. N Tok Junction, Alaska.

MARGINAL RECORDS (Hall and Cockrum, 1953:411). —Alaska: Bettles; near Fort Yukon; Eagle; type locality; head of Glacier Creek, Mt. McKinley; Nulato.

Microtus pennsylvanicus terraenovae (Bangs)

1894. *Arvicola terraenovae* Bangs, Proc. Biol. Soc. Washington, 9:129, July 27, type from Codroy, Newfoundland.

1936. *M[icrotus]. p[ennsylvanicus]. terraenovae,* D. L. Davis, Jour. Mamm., 17:290, August 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:411). —Newfoundland: type locality; Penguin Island.

Microtus pennsylvanicus uligocola S. Anderson

1956. *Microtus pennsylvanicus uligocola* S. Anderson, Univ. Kansas Publ., Mus. Nat. Hist., 9:94, May 10, type from 6 mi. W and ¾ mi. S Loveland, 5200 ft., Larimer Co., Colorado.

MARGINAL RECORDS.—Colorado (S. Anderson, 1956: 95): 3 mi. N Loveland; Orchard; 12 mi. S Colorado Springs; *Divide*; Williams Ranch, near Tarryall; Clear Creek, N side of Idaho Springs; *Boulder*; type locality.

Microtus breweri (Baird)
Beach Vole

1858. *Arvicola breweri* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):525, July 14, type from Muskeget Island, off Nantucket, Massachusetts. Known from type locality only.
1896. *Microtus breweri*, Miller, Proc. Boston Soc. Nat. Hist., 27:83, June.

Average and extreme external measurements of 5 males and 8 females: 200.8 (191–211), 186 (176–203); 49.8 (45–58), 47.9 (41–56); 23.7 (22.4–25), 23.1 (22–24). Upper parts buffy gray, with scattered brown and black-tipped hairs; sides paler; venter tinged with sulphur yellow; tail bicolor, rusty brown or blackish above, soiled whitish below. This insular species is closely related to *M. pennsylvanicus* and is said to differ as follows: paler, longer, and coarser pelage; anteriorly wider nasals; and longer interparietal.

Microtus nesophilus V. Bailey
Gull Island Vole

1898. *Microtus insularis* V. Bailey, Proc. Biol. Soc. Washington, 12:86, April 30, type from Great Gull Island, off eastern extremity of Long Island, Suffolk Co., New York. Not *Lemmus insularis* [= *Microtus agrestis*] Nilsson, 1844. Known only from type locality and adjacent *Little Gull Island* (Miller, Bull. New York State Mus., 6:324, November 18, 1899).
1898. *Microtus nesophilus* V. Bailey, Science, n. s., 8:783, December 2, a renaming of *Microtus insularis* V. Bailey.

External measurements: 185; 41; 20–21. Upper parts dark yellowish bister heavily mixed with black hairs, darkest on nose and face; venter dusky, washed with cinnamon; tail bicolor, blackish above, dark brown below. This insular species, closely related to *M. pennsylvanicus*, is said to differ as follows: darker pelage; shorter and wider skull; more widely spreading zygomata; deeper prezygomatic notches. This species probably is extinct (see V. Bailey, 1900:27 and Miller, 1899:324).

Microtus montanus
Montane Vole

External measurements: 140–192; 31–69; 18–25. Weight, 37.3–85.0 grams. Upper parts some shade of brownish, often with buffy or grayish wash, and with mixture of black-tipped hairs; sides lighter and more buffy; venter white to gray, sometimes washed with buffy; tail bicolor, blackish brown to black above, grayish below. Body 2.4 to 2.8 times as long as tail; tail 2.2 to 2.4 times as long as hind foot. Middle upper molar with 4 closed triangles; incisive foramina constricted posteriorly. In Nevada the number of embryos in 63 females varied from 2 to 8, usually was 5 or 6, and averaged 6.3.

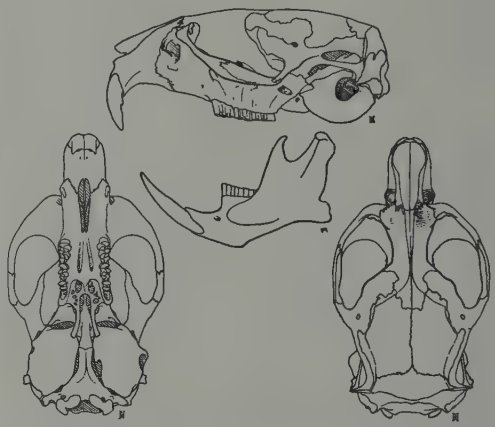


Fig. 400. *Microtus montanus micropus*, Cleveland Ranch, Nevada, No. 46288 M.V.Z., ♂, X 1½.

Microtus montanus amosus Hall and Hayward

1941. *Microtus montanus amosus* Hall and Hayward, The Great Basin Naturalist, 2:105, July 20, type from Torrey, Wayne Co., Utah.

MARGINAL RECORDS (Hall and Cockrum, 1953:413).—Utah: Vernal, 5300 ft.; Ashley Creek, 2 mi. S Jensen; Steep Creek, Aquarius Plateau; 20 mi. N Escalante, 9500 ft.; Mammoth R.S.; La Point.

Microtus montanus arizonensis V. Bailey

1898. *Microtus montanus arizonensis* V. Bailey, Proc. Biol. Soc. Washington, 12:88, April 30, type from Springerville, Apache Co., Arizona.

MARGINAL RECORDS (Hall and Cockrum, 1953:413).—New Mexico: Jemez Mts. Arizona: West Fork Black River, 7700 ft.; type locality. New Mexico: Nutria.

Microtus montanus canescens V. Bailey

1898. *Microtus nanus canescens* V. Bailey, Proc. Biol. Soc. Washington, 12:87, April 30, type from Conconully, Okanogan Co., Washington.
1838. *Microtus montanus canescens*, Hall, Proc. Biol. Soc. Washington, 51:133, August 23.

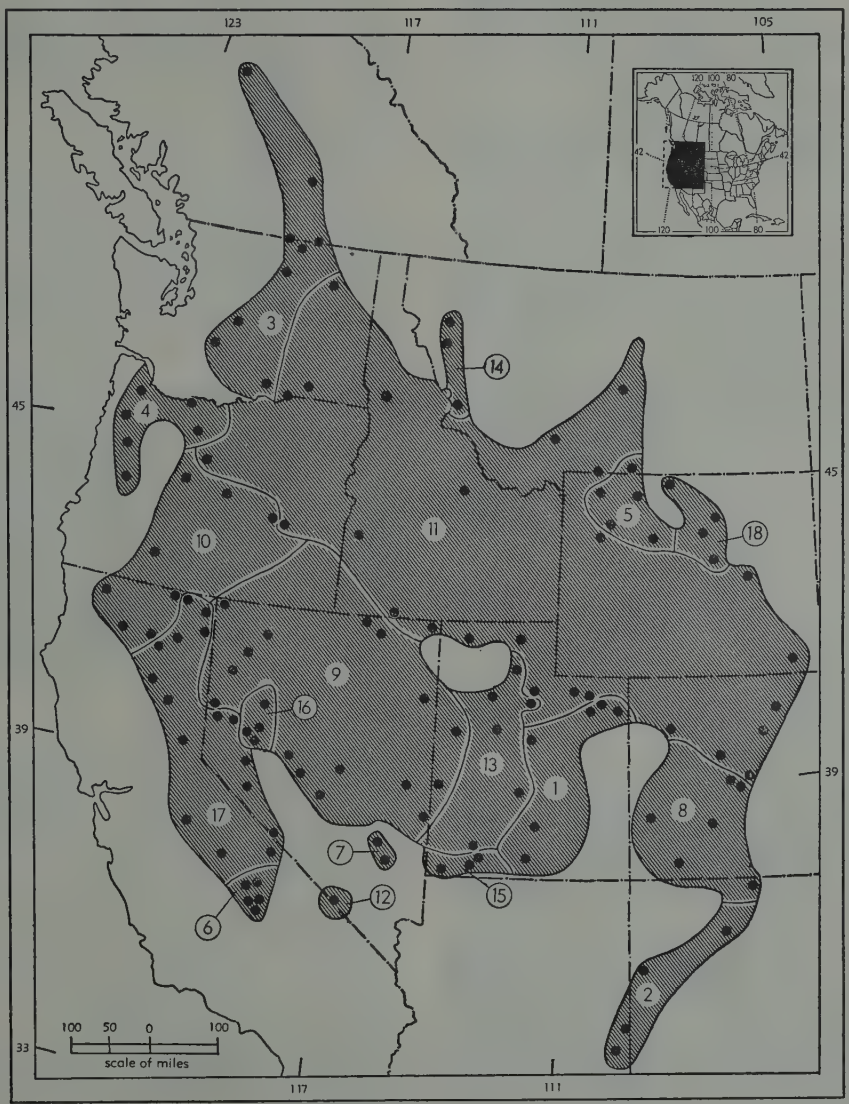
MARGINAL RECORDS (Cowan and Guiguet, 1956: 220, unless otherwise noted).—British Columbia: 10 mi. W Williams Lake; Vernon; Midway. Washington (Hall and Cockrum, 1953:413): Molson; Benton City; Bumping Lake; Blewett Pass; type locality. British Columbia: Osoyoos.

Microtus montanus canicaudus Miller

1897. *Microtus canicaudus* Miller, Proc. Biol. Soc. Washington, 11:67, April 21, type from McCoy, Willamette Valley, Polk Co., Oregon.

1951. *Microtus montanus canicaudus*, Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:77, October 1.

MARGINAL RECORDS (Hall and Cockrum, 1953:414).—Oregon: Banks; Hood River; Wapinitia; Eugene; Corvallis; Sheridan.



Map 407. *Microtus montanus.*

Guide to subspecies

1. *M. m. amosus*
2. *M. m. arizonensis*
3. *M. m. canescens*
4. *M. m. canicaudus*
5. *M. m. codiensis*
6. *M. m. dutcheri*
7. *M. m. fucosus*
8. *M. m. fusus*
9. *M. m. micropus*
10. *M. m. montanus*
11. *M. m. nanus*
12. *M. m. nevadensis*
13. *M. m. nexus*
14. *M. m. pratincola*
15. *M. m. rivularis*
16. *M. m. undosus*
17. *M. m. yosemite*
18. *M. m. zygomaticus*

Microtus montanus codiensis S. Anderson

1954. *Microtus montanus codiensis* S. Anderson, Univ. Kansas Publ., Mus. Nat. Hist., 7:497, July 23, type from 3⅜ mi. E and ¾ mi. S Cody, 5020 ft., Park Co., Wyoming.

MARGINAL RECORDS (S. Anderson, 1954:500).—Montana: Beartooth Mts. Wyoming: type locality; 3 mi. N, 10 mi. W Thermopolis, 4950 ft.; Needle Mtn., 10,500 ft.; SW slope Whirlwind Peak, 9000 ft.

Microtus montanus dutcheri V. Bailey

1898. *Microtus dutcheri* V. Bailey, Proc. Biol. Soc. Washington, 12:85, April 30, type from Big Cottonwood Meadows, 10,100 ft., SE of Mt. Whitney, Inyo Co., California.
1913. *Microtus montanus dutcheri*, Grinnell, Proc. California Acad. Sci., ser. 4, 3:317, August 28.

MARGINAL RECORDS (Hall and Cockrum, 1953:415).—California: Cottonwood Lakes, 11,100 ft.; *Little Cottonwood Creek*; Monache Meadows; Jackass Meadow; Jordon Hot Springs, 6700 ft.; Whitney Creek, 10,650 ft.

Microtus montanus fucosus Hall

1935. *Microtus montanus fucosus* Hall, Univ. California Publ. Zool., 40:421, October 25, type from Hiko, 4000 ft., Pahranagat Valley, Lincoln Co., Nevada.

MARGINAL RECORDS (Hall and Cockrum, 1953:415).—Nevada: 3 mi. N Crystal Spring, 4000 ft., Pahranagat Valley; 4 mi. S Alamo, Pahranagat Valley.

Microtus montanus fusus Hall

1938. *Microtus montanus fusus* Hall, Proc. Biol. Soc. Washington, 51:133, August 23, type from 2¾ mi. E Cochetopa Pass, Saguache Co., Colorado.

MARGINAL RECORDS (S. Anderson, 1954:503–504, unless otherwise noted).—Colorado: 5 mi. W Independence Pass, 11,000 ft.; Twin Lakes (V. Bailey, 1900:31); type locality. New Mexico: 6 mi. W Hopewell, 9900 ft. Colorado: Florida, 6800 ft.; Coventry.

Microtus montanus micropus Hall

1935. *Microtus montanus micropus* Hall, Univ. California Publ. Zool., 40:417, October 25, type from Cleveland Ranch, 6000 ft., Spring Valley, White Pine Co., Nevada.

MARGINAL RECORDS (Hall and Cockrum, 1953:415–416).—Nevada: Barrel Spring, 5700 ft., 9⅛ mi. E, 3⅜ mi. N Fort Bidwell; 7 mi. NW Mountain City, Owyhee River; summit between heads of Copper and Coon creeks, Jarbidge Mts.; Salt Spring, 4200 ft. Utah: Fish Springs, 4400 ft.; 5 mi. S Garrison, 5400 ft. Nevada: 3¾ mi. N Eagle Valley, 5600 ft.; Steptoe Creek, 6400 ft.; Fish Spring Valley 6⅛ mi. N Fish Lake, 6000 ft.; Monitor Valley, 9 to 9¾ mi. E Toquima Peak, 7000 ft.; Bells Ranch, 6890 ft.; Campbell Creek Ranch, 5500 ft.; Pine Forest Range; Flowing Spring, 7 mi. E, 3⅛ mi. N Division Peak, 4200 ft.; Deep Hole, 4000 ft.; 4¾ mi. S Flanigan, 4200 ft.

Microtus montanus montanus (Peale)

1848. *Arvicola montana* Peale, Mammalia and ornithology, *in* U.S. Explor. Exped. . . . , 8:44, type from headwaters of the Sacramento River, near Mt. Shasta, Siskiyou Co., California.
1897. [*Microtus*] *montanus*, Trouessart, Catalogus mammalium . . . , p. 563.
1858. *Arvicola longirostris* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):531, July 14, type perhaps from upper Pit River, California (see Kellogg, Univ. California Publ. Zool., 21:263–264, April 18, 1922).

MARGINAL RECORDS (Hall and Cockrum, 1953:416).—Oregon: Sisters; 2 mi. SW Barnes; 5 mi. NNE Burns; Malheur Lake. California: E side Tule Lake; Fort Crook; Dale Meadows, Mt. Eddy; Stud Horse Canyon, Siskiyou Mts. Oregon: Fort Klamath.

Microtus montanus nanus (Merriam)

1891. *Arvicola* (*Mynomes*) *nanus* Merriam, N. Amer. Fauna, 5:63, July 30, type from Pahsimeroi Mts., head of Pahsimeroi River, 9350 ft., Custer Co., Idaho.
1938. *Microtus montanus nanus*, Hall, Proc. Biol. Soc. Washington, 51:133, August 23.
1917. *Microtus montanus caryi* V. Bailey, Proc. Biol. Soc. Washington, 30:29, February 21, type from Milford, Fremont Co., Wyoming. Regarded as inseparable from *nanus* by S. Anderson, Univ. Kansas Publ., Mus. Nat. Hist., 7:494, July 23, 1954.

MARGINAL RECORDS (Hall and Cockrum, 1953:416, unless otherwise noted).—Washington: Gifford. Idaho: Nezperce (211781 NM); type locality. Montana: west fork of West Fork, Gallatin River; Big Snowy Mts.; Lamar River, 7000 ft. (S. Anderson, 1954:497). Wyoming (S. Anderson, 1954:496–497): 2 mi. W pass, Black Rock Creek; Beaver; 11 mi. N, 5⅛ mi. E Cheyenne, 5450 ft. Colorado (*ibid.*): 6 mi. W, ¾ mi. S Loveland, 5200 ft.; Nederland; Trout Creek Ranch, 2 mi. N Garo; Eagle; Meeker. Utah: Henrys Park, Henrys Fork; Bald Mtn., 25 mi. NE Kamas; 5 mi. E Park City; Anderson Ranch, Blacksmith Fork, 5500 ft.; *Logan*; Kelton, 4225 ft. Nevada: Goose Creek, 5000 ft., 2 mi. W Utah boundary. Idaho: Three Creek, Owyhee County; Nampa. Oregon: ridge N of Crane; Hay Creek. Washington: 5 mi. E Wallula; Prescott.

Microtus montanus nevadensis V. Bailey

1898. *Microtus nevadensis* V. Bailey, Proc. Biol. Soc. Washington, 12:86, April 30, type from Ash Meadows, Nye Co., Nevada. Known only from type locality and 3⅛ mi. N thereof (see Hall, Mammals of Nevada, Univ. California Press, p. 549, July 1, 1946).
1935. *Microtus montanus nevadensis*, Hall, Univ. California Publ. Zool., 40:423, October 25.

Microtus montanus nexus Hall and Hayward

1941. *Microtus montanus nexus* Hall and Hayward, The Great Basin Naturalist, 2:106, July 20, type from West Canyon, Oquirrh Range, Utah Co., Utah.

MARGINAL RECORDS (Hall and Cockrum, 1953:416–417).—Utah: Ogden; 4 mi. NE Snyderville, 5600 ft.; 10 mi. N Fish Lake, Fishlake Mts., 10,000 ft.; Cedar Breaks National Monument; Little Valley, Sheeprock Mts., 5500 ft.; Tooele.

Microtus montanus pratincola Hall and Kelson

1951. *Microtus montanus pratincolus* Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:75, October 1, type from 6 mi. E Hamilton, 3700 ft., Ravalli Co., Montana.

MARGINAL RECORDS (Hall and Cockrum, 1953:417). —Montana: end of W arm Flathead Lake; Canyon Creek; Hotsprings Creek.

Microtus montanus rivularis V. Bailey

1898. *Microtus nevadensis rivularis* V. Bailey, Proc. Biol. Soc. Washington, 12:87, April 30, type from St. George, Washington Co., Utah.
1900. *Microtus montanus rivularis* V. Bailey, N. Amer. Fauna, 17:29, June 6.

MARGINAL RECORDS (Hall and Cockrum, 1953:417). —Utah: Duck Creek, 8500 ft.; Blue Springs, Zion National Park; type locality.

Microtus montanus undosus Hall

1935. *Microtus montanus undosus* Hall, Univ. California Publ. Zool., 40:420, October 25, type from Lovelock, Pershing Co., Nevada.

MARGINAL RECORDS (Hall and Cockrum, 1953:417). —Nevada: type locality; Stillwater; 10 mi. SSE Fallon; 4 mi. W Fallon.

Microtus montanus yosemite Grinnell

1914. *Microtus montanus yosemite* Grinnell, Proc. Biol. Soc. Washington, 27:207, October 31, type from Yosemite Valley, 4000 ft.; Mariposa Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:417). —California: Steel Meadow, 4700 ft.; Goose Lake [Davis Creek]; southern end of Middle Lake. Nevada: Pyramid Lake, 2 mi. W Sutcliffe; 2¾ mi. W Hazen; Schurz Indian dam, Walker River, 4300 ft.; N fork Cat Creek, 8800 ft., Mt. Grant; Fish Lake, 4800 ft. California: Deep Spring Lake, 5000 ft.; Shaver Ranger Station, 5300 ft.; Gentry's, Big Oak Flat Road, 5800 ft.; Cisco; Buck's Ranch, 5100 ft.; Battle Creek Meadows; Cassel, 3000 ft.; Bieber.

Microtus montanus zygomaticus S. Anderson

1954. *Microtus montanus zygomaticus* S. Anderson, Univ. Kansas Publ., Mus. Nat. Hist., 7:500, July 23, type from Medicine Wheel Ranch, 9000 ft., 28 mi. E Lovell, Big Horn Co., Wyoming.

MARGINAL RECORDS (S. Anderson, 1954:502).—Wyoming: type locality; 7½ mi. W, 1 mi. S Buffalo, 6500 ft.; Buffalo Creek, 27 mi. N, 1 mi. E Powder River, 6075 ft.; W slope, head of Trappers Creek, 9500 ft.

Microtus californicus
California Vole

Revised by R. Kellogg, Univ. California Publ. Zool., 21:1–42, 1 fig., December 28, 1918.

External measurements: 157–211; 39–68; 20–25. Upper parts vary from tawny olive through cinnamon brown, with mixture of long, dark overhairs that vary from light seal brown to black; sides lighter, with fewer long overhairs; venter neutral gray, often with white-tipped hairs; tail bicolor, clove brown to black above, grayish below. Body 2.0–2.5 times as long as tail; tail 2.3–2.6 times as long as hind foot; 4 closed triangles in M2; incisive foramina are not constricted posteriorly but rounded at both ends and widest in middle.

Donald M. Hatfield's (1935:261–271) study revealed that this species has three distinct pelages: juvenal, by the fifth day; post-juvenal, by the third week; and adult by the eighth or ninth week. He was the first to learn that there is a regular pattern in the post-juvenal and juvenal molts but that the progress of molt in the adults is spotty and irregular —a phenomenon now known to characterize most, or all, microtine rodents.

The young are born blind, deaf, hairless (except that the facial vibrissae are in evidence), pink, and weigh 2.3 to 3.1 grams. The eyes open on the tenth day, the ears function on the seventh or eighth day, pigment in the skin begins to appear in the eighth hour after birth, and adults average 53 grams in weight. Females breed when they weigh only 21 grams at 21 to 22 days of age, but males first breed at six weeks of age. The gestation period is approximately 21 days.

Microtus californicus aequivocatus Osgood

1928. *Microtus californicus aequivocatus* Osgood, Jour. Mamm., 9:56, February 9, type from San Quintín, Baja California.

MARGINAL RECORDS (Hall and Cockrum, 1953:419). —Baja California: San José; San Antonio; 1 mi. E El Rosario; type locality; San Telmo.

Microtus californicus aestuarinus R. Kellogg

1918. *Microtus californicus aestuarinus* R. Kellogg, Univ. California Publ. Zool., 21:15, December 28, type from Grizzly Island, Solano Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:419). —California: Mill Creek, 2 mi. NE Tehama; Chico; Chambers Ravine, 4 mi. N Oroville; Tracy Lake, 6 mi. SW Galt; La Grange; Tulare Lake basin; Tracy; type locality; Bolinas; Petaluma; Cordelia.

Microtus californicus californicus (Peale)

1848. *Arvicola californica* Peale, Mammalia and ornithology, *in* U.S. Explor. Exped. . . . , 8:46, type from vicinity of San Francisco Bay, California, probably at San Francisquito Creek, near Palo Alto, Santa Clara Co.
1897. [*Microtus*] *californicus*, Trouessart, Catalogus mammalium, p. 563.
1853. *Arvicola edax* Le Conte, Proc. Acad. Nat. Sci. Philadelphia, 6:405, type from California, south of San Francisco. Probably Monterey according to R. Kellogg, Univ. California Publ. Zool., 21:18, December 28, 1918.
1858. *Arvicola trowbridgii* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):529, July 14, type from Monterey, California.

MARGINAL RECORDS (Hall and Cockrum, 1953:419, unless otherwise noted).—California: Walnut Creek; slopes of Mt. Diablo; Sweeney's Ranch, 22 mi. S Las Baños; Pozo (Grinnell, 1933:186); Morro; Monterey; Salinas Valley; Boulder Creek; Pescadero; Black Mtn.

Microtus californicus constrictus V. Bailey

1900. *Microtus californicus constrictus* V. Bailey, N. Amer. Fauna, 17:36, June 6, type from Cape Mendocino, Humboldt Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:419). —California: Eureka; Fair Oaks; Cuddeback; Capetown.

Microtus californicus eximius R. Kellogg

1918. *Microtus californicus eximius* R. Kellogg, Univ. California Publ. Zool., 21:12, December 28, type from Lierly's Ranch, 2340 ft., 4 mi. S Mt. Sanhedrin, Mendocino Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:419). —Oregon: Drain; Siskiyou. California: Mayten; Cassel; Turner's; 2 mi. S South Yolla Bolly Mtn.; Rumsey; Olema; Mendocino City; Helena. Oregon: Rogue River Valley near Grants Pass.

Microtus californicus grinnelli Huey

1931. *Microtus californicus grinnelli* Huey, Trans. San Diego Soc. Nat. Hist., 7:47, December 19, type from Sangre de Cristo in Valle San Rafael on W base Sierra Juárez, Baja California, lat. 31° 52′ N, long. 116° 06′ W. Known only from the type locality.

Microtus californicus halophilus von Bloeker

1937. *Microtus californicus halophilus* von Bloeker, Proc. Biol. Soc. Washington, 50:156, September 10, type from Moss Landing, Monterey Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:420). —California: mouth of Elkhorn Slough; Seaside.

Microtus californicus huperuthrus Elliot

1903. *Microtus californicus huperuthrus* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3:161, May 7, type from La Grulla, San Pedro Mártir Mts., Baja California (see Elliot, Field Columb. Mus., Publ. 115, Zool. Ser., 8:292, March 4, 1907.

1903. *Microtus californicus hyperythrus* Elliot, Field Columb. Mus., Publ. 79, Zool. Ser., 3:218, August 15. This was a change of transliteration.

1926. *Microtus californicus perplexabilis* Grinnell, Jour. Mamm., 7:223, August 9, type from La Grulla, 7000 ft., Sierra San Pedro Mártir, Baja California.

MARGINAL RECORDS (Hall and Cockrum, 1953:420). —Baja California: Concepción; Vallecitos; San Ramón; type locality.

Microtus californicus kernensis R. Kellogg

1918. *Microtus californicus kernensis* R. Kellogg, Univ. California Publ. Zool., 21:26, December 28, type from Fay Creek, 4100 ft., Kern Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:420). —California: Taylor Meadow; Onyx; Fort Tejon; Buena Vista Lake; Bakersfield.

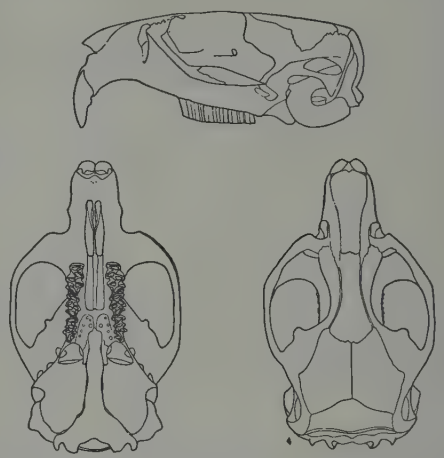


Fig. 401. *Microtus californicus kernensis*, Thompson Canyon, 3900 ft., Walker Basin, Kern Co., California, No. 60281 M.V.Z., ♂, X 1½.

Microtus californicus mariposae R. Kellogg

1918. *Microtus californicus mariposae* R. Kellogg, Univ. California Publ. Zool., 21:19, December 28, type from 1¾ mi. W El Portal, 1800 ft., Mariposa Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:420). —California: Dutch Flat; type locality; Minkler; Clovis; Pleasant Valley; Carbondale.

Microtus californicus mohavensis R. Kellogg

1918. *Microtus californicus mohavensis* R. Kellogg, Univ. California Publ. Zool., 21:29, December 28, type from Victorville, 2700 ft., San Bernardino Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:420). —California: Oro Grande; type locality.

Microtus californicus paludicola Hatfield

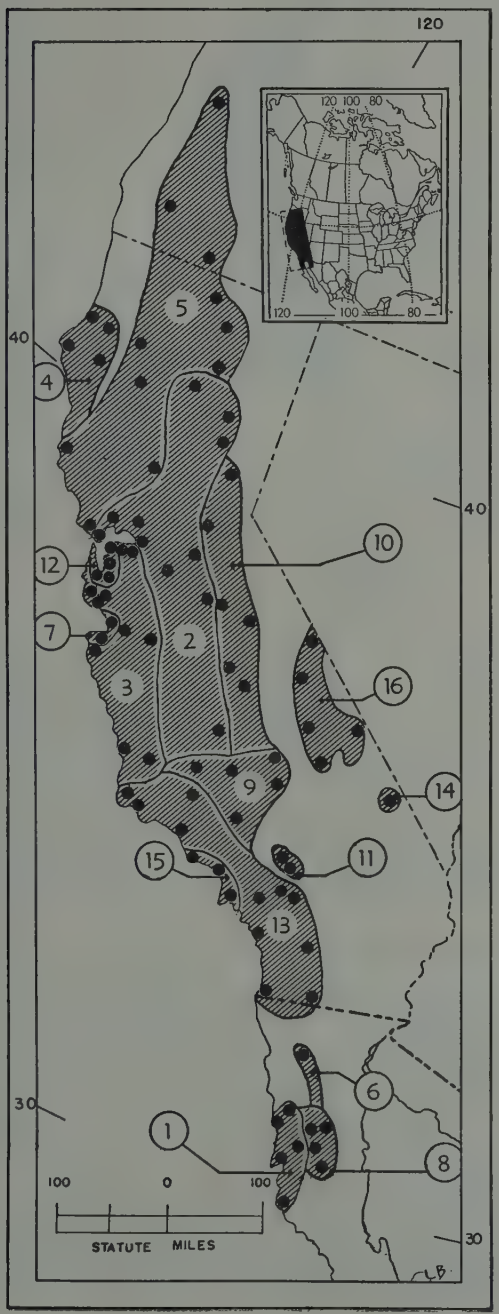
1935. *Microtus californicus paludicola* Hatfield, Jour. Mamm., 16:316, November 15, type from Melrose Marsh, Alameda Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:420). —California: W base El Cerrito (Knoll); ¾ mi. E Bay Farm Island; Alvarado; Redwood City.

Microtus californicus sanctidiegi R. Kellogg

1918. *Microtus californicus neglectus* R. Kellogg, Univ. California Publ. Zool., 21:31, December 28, type from Escondido, 640 ft., San Diego Co., California. Not *Arvicola neglectus* Jenyns, 1841 [= *Microtus agrestis neglectus*].

1922. *Microtus californicus sanctidiegi* R. Kellogg, Proc. Biol. Soc. Washington, 35:78, March 20, a renaming of *M.c. neglectus* R. Kellogg.



MARGINAL RECORDS (Hall and Cockrum, 1953:421).—California: Gaviota Pass; Mt. Piños; Bluff Lake; Fish Creek; Garnet Queen Mine, Santa Rosa Mts.; Mountain Spring; mouth of Tiajuana River; San Onofre; Santa Ana Cañon; Matilija; Santa Barbara.

Microtus californicus scirpensis V. Bailey

1900. *Microtus scirpensis* V. Bailey, N. Amer. Fauna, 17:38, June 6, type from spring near Shoshone, 1560 ft., on Amargosa River, eastern Inyo Co., California. Known only from type locality.

1918. *Microtus californicus scirpensis*, R. Kellogg, Univ. California Publ. Zool., 21:24, December 28.

Microtus californicus stephensi von Bloeker

1932. *Microtus californicus stephensi* von Bloeker, Proc. Biol. Soc. Washington, 45:134, September 9, type from Playa del Rey, Los Angeles Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:421).—California: Point Mugu; type locality; Sunset Beach.

Microtus californicus vallicola V. Bailey

1898. *Microtus californicus vallicola* V. Bailey, Proc. Biol. Soc. Washington, 12:89, April 30, type from Lone Pine Creek, 4500 ft., where it cuts through Alhambra Hills near Lone Pine, Inyo Co., California. (See A. B. Howell, Jour. Mamm., 4:266, November 1, 1923.)

MARGINAL RECORDS (Hall and Cockrum, 1953:421).—California: Benton; head of Willow Creek at N end Panamint Mts.; Olancha; Kearsarge Pass (Grays); Bishop Creek.

Microtus townsendii
Townsend's Vole

External measurements: 169–225; 48–70; 20–26; 15–17. Fur thin and harsh; ears prominent above fur. Upper parts dark brownish with heavy mixture of black-tipped guard hairs; venter grayish to grayish brown or smoky; tail slightly bicolored, blackish above; body 2.2 to 2.4 times as long as tail; tail 2.2 to 2.6 times as long as hind foot; hip glands conspicuous in adult males; M2 with 4 closed triangles; incisive foramina long, narrow and constricted posteriorly. Embryos number 5 to 8, with 7 being the mean.

Map 408. *Microtus californicus.*

1. *M. c. aequivocatus*
2. *M. c. aestuarius*
3. *M. c. californicus*
4. *M. c. constrictus*
5. *M. c. eximius*
6. *M. c. grinnelli*
7. *M. c. halophilus*
8. *M. c. huperuthrus*
9. *M. c. kernensis*
10. *M. c. mariposae*
11. *M. c. mohavensis*
12. *M. c. paludicola*
13. *M. c. sanctidiegi*
14. *M. c. scirpensis*
15. *M. c. stephensi*
16. *M. c. vallicola*

Microtus townsendii cowani Guiguet

1955. *Microtus townsendii cowani* Guiguet, Rept. Provincial Mus. Nat. Hist. and Anthro., British Columbia, for 1954, p. B67, August 1, type from Triangle Island, lat. 129° 05′ W, long. 50° 55′ N, British Columbia. Known only from the type locality.

Microtus townsendii cummingi Hall

1936. *Microtus townsendii cummingi* Hall, Murrelet, 17:15, March 28, type from Bowen Island, Howe Sound, British Columbia.

MARGINAL RECORDS.—British Columbia: Texada Island (Cowan and Guiguet, 1956:223); type locality.

Microtus townsendii laingi Anderson and Rand

1943. *Microtos townsendii laingi* Anderson and Rand, Canadian Field-Nat., 57:74, October 17, type from Port Hardy, Vancouver Island, British Columbia.

MARGINAL RECORDS (Cowan and Guiguet, 1956: 223).—British Columbia: Cape Scott; Hurst Island; Sayward; Beaver Creek, west of Port Alberni, thence westward along *Alberni Inlet* and up coast to point of beginning. Also on *Hope* and *Nigei* islands.

Microtus townsendii pugeti Dalquest

1940. *Microtus townsendii pugeti* Dalquest, Murrelet, 21:7, April 30, type from Neck Point, NW part Shaw Island, San Juan Co., Washington.

MARGINAL RECORDS (Hall and Cockrum, 1953:422). —Washington: Friday Harbor, San Juan Island; Strawberry Bay, Cypress Island.

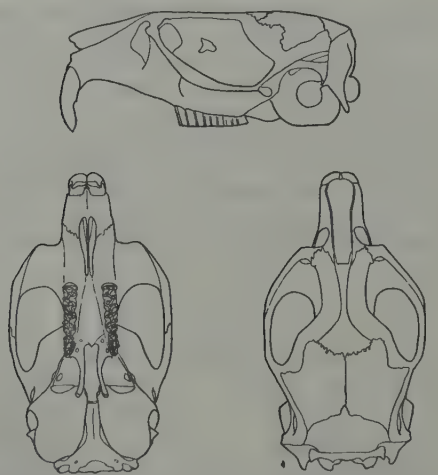
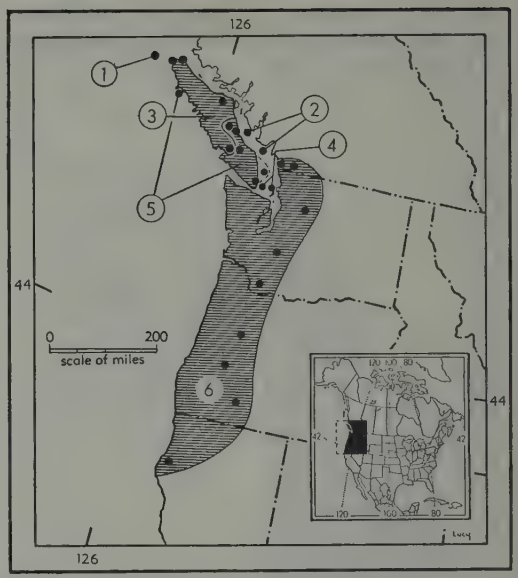


Fig. 402. *Microtus townsendii townsendii*, 1 mi. N Oregon City, Clackamas Co., Oregon, No. 32484 M.V.Z., ♂, X 1⅛.



Map 409. *Microtus townsendii.*

1. *M. t. cowani*
2. *M. t. cummingi*
3. *M. t. laingi*
4. *M. t. pugeti*
5. *M. t. tetramerus*
6. *M. t. townsendii*

Microtus townsendii tetramerus (Rhoads)

1894. *Arvicola* (*Tetramerodon*) *tetramerus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:283, October 23, type from Beacon Hill Park, Victoria, Vancouver Island, British Columbia.

1936. *Microtus townsendii tetramerus*, Hall, Murrelet, 17: 15, March 28.

MARGINAL RECORDS (Cowan and Guiguet, 1956: 224).—British Columbia: Forbidden Plateau; Comox; type locality; thence northwest up coast of Vancouver Island and northeast along *Alberni Inlet* to Alberni, thence to point of beginning. Also on Bunsby Island and Saltspring Island.

Microtus townsendii townsendii (Bachman)

1839. *Arvicola townsendii* Bachman, Jour. Acad. Nat. Sci. Philadelphia, 8:60, type from Columbia River; according to V. Bailey (N. Amer. Fauna, 17:46, June 6, 1900), near mouth of Willamette, on or near Wappatoo (or Sauvie) Island.

1896. *M[icrotus]. townsendi*, Miller, N. Amer. Fauna, 12: 66, July 23.

1848. *Arvicola occidentalis* Peale, Mammalia and ornithology, *in* U.S. Explor. Exped. . . . , 8:45, type from Puget Sound.

MARGINAL RECORDS (Hall and Cockrum, 1953:423, unless otherwise noted).—British Columbia: Port Moody; Chilliwak. Washington: Sauk; Nisqually Flats; Clark County. Oregon: *1 mi. N Oregon City* (*op. cit.*:462); Salem; Eugene; Prospect. California: Humboldt Bay, near Eureka, thence up coast to point of beginning.

Microtus oeconomus

Tundra Vole

External measurements: 160–225; 36–53; 20–25. Upper parts vary from dusky gray, with traces of brownish, through rich buff, tawny or cinnamon brown and rusty brown. In all there is a mixture of black-tipped hairs; sides paler; venter white and in some subspecies washed with dark buff; tail varies from slightly to sharply bicolor, pale dusky to black above, whitish to pale buff below; body 2.8–3.6 times as long as tail; tail 1.8 to 2.4 times as long as hind foot; anterior lower molar (m1) has only four closed triangles, fifth triangle being open and confluent with short terminal loop; incisive foramina short and constricted posteriorly.

Ognev (Comptes Rendus Acad. Sci. U.S.S.R., new ser., 44 [No. 4]:165, 1944) suggests that *Microtus oeconomus* (Pallas, 1776) preoccupies *Microtus* (*Stenocranius*) *gregalis* (Pallas, 1779). In 1950 Ognev (1950:258) listed the American subspecies of what is here termed *oeconomus* as subspecies of *Microtus ratticeps*. Ellerman and Morrison-Scott (1951:705), however, take a different view and retain the specific name *oeconomus*.

On the subspecific level, for Alaskan populations, Rausch (1953:129–131) has proposed an arrangement that seems to be superior to any other arrangement so far proposed including the one adopted here. But, Rausch did not account for any specimens at all from several localities, in Canada and central Alaska, from which earlier authors had assigned specimens to subspecies different than those that Rausch's arrangement implies occur at those localities. Therefore, from the literature alone, it has not been possible satisfactorily to reflect his findings on Map 410. More study along the lines that Rausch (*op. cit.*) followed, including the examination of all previously reported specimens, almost certainly will drastically alter the ranges of subspecies as shown on Map 410.

Microtus oeconomus amakensis O. J. Murie

1930. *Microtus amakensis* O. J. Murie, Jour. Mamm., 11:74, February 11, type from Amak Island, Bering Sea, Alaska. Known only from type locality.

1952. *Microtus oeconomus amakensis*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:309, November 17.

Microtus oeconomus elymocetes Osgood

1906. *Microtus elymocetes* Osgood, Proc. Biol. Soc. Washington, 19:71, May 1, type from east side of Montague Island, Prince William Sound, Alaska. Restricted to Montague Island (see Heller, Univ. California Publ. Zool., 5:342, March 5, 1910).

1942. *M[icrotus]. oec[onomus]. elymocetes*, Zimmermann, Archiv f. Naturgesch., 11:188, September 10.

Microtus oeconomus gilmorei Setzer

1952. *Microtus oeconomus gilmorei* Setzer, Proc. Biol. Soc. Washington, 65:75, April 25, type from Point Lay, lat. 69° 46′ N, long. 163° 04′ W, Alaska (see Rausch, Arctic, 6:130, July, 1953, who considers *gilmorei* indistinguishable from *M. o. endoecus*).

MARGINAL RECORDS (Hall and Cockrum, 1953:424).—Alaska: 50 mi. S Barrow; Umiat; Anaktuvuk Pass; Chandler Lake; Killik River; type locality; Utukok River, 200 mi. SW Point Barrow; Kaolak River [also (Bee and Hall, 1956: 135–136) west as far as *Cape Thompson* to *Cape Lisburne* and east to *Barter Island* and *Lake Schrader*].

Microtus oeconomus innuitus Merriam

1900. *Microtus innuitus* Merriam, Proc. Washington Acad. Sci., 2:21, March 14, type from Northeast Cape, St. Lawrence Island, Bering Sea, Alaska.

1942. *M[icrotus]. oec[onomus]. innuitus*, Zimmermann, Archiv. f. Naturgesch., 11:187, September 10.

MARGINAL RECORDS (Hall and Cockrum, 1953:425).—Alaska (St. Lawrence Island): type locality; Sevoonga.

Microtus oeconomus kadiacensis Merriam

1897. *Microtus kadiacensis* Merriam, Proc. Biol. Soc. Washington, 11:222, July 15, type from Kodiak Island, Alaska.

1942. *M[icrotus]. oec[onomus]. kadiacensis*, Zimmermann, Archiv f. Naturgesch., 11:187, September 10.

MARGINAL RECORDS (Hall and Cockrum, 1953:425).—Alaska: mouth of Chulitna River; Iliamna Village; Litnik, Afognak Island; type locality; Cold Bay; Izembek Bay, Alaska Peninsula; Nushagak; Kakwok; head of Chulitna River.

Microtus oeconomus macfarlani Merriam

1900. *Microtus macfarlani* Merriam, Proc. Washington Acad. Sci., 2:24, March 14, type from Fort Anderson, Anderson River, Mackenzie.

1942. *M[icrotus]. oec[onomus]. macfarlani*, Zimmermann, Archiv f. Naturgesch., 11:187, September 10.

1909. *Microtus operarius endoecus* Osgood, N. Amer. Fauna, 30:23, October 7, type from mouth of Charlie Creek, Yukon River, about 50 mi. above Circle, Alaska (see Rausch, Arctic, 6:130, July, 1953, who regards *endoecus* as a valid subspecies ranging over most of northern and eastern Alaska).

MARGINAL RECORDS (Hall and Cockrum, 1953:425, unless otherwise noted).—Mackenzie: Toker Point, E along coast to Bathurst Inlet. Yukon: Macmillan Pass area; Rose River. British Columbia: Stonehouse Creek, 5½ mi. W junction Stonehouse Creek and Kelsall River. Alaska: 5 mi. NNE Gulkana, 1700 ft. (Baker and Findley, 1954:477); Peters Creek, 300 ft., 20 mi. NE Anchorage (*ibid.*); McKinley River; Ladd (Strecker, *et al.*, 1952:479); Circle. Yukon: Firth River, and along coast east to point of beginning.

Microtus oeconomus operarius (Nelson)

1893. *Arvicola operarius* Nelson, Proc. Biol. Soc. Washington, 8:139, December 28, type from St. Michael, Norton Sound, Alaska.

1942. *M[icrotus]. oec[onomus]. operarius,* Zimmermann, Archiv f. Naturgesch., 11:187, September 10.

MARGINAL RECORDS (Hall and Cockrum, 1953:425). —Alaska: Kowak [= Kobuk] River; Bettles; Fort Yukon; Tyonek, Cook Inlet; Bethel; Cape Vancouver; type locality; Cape Prince of Wales.

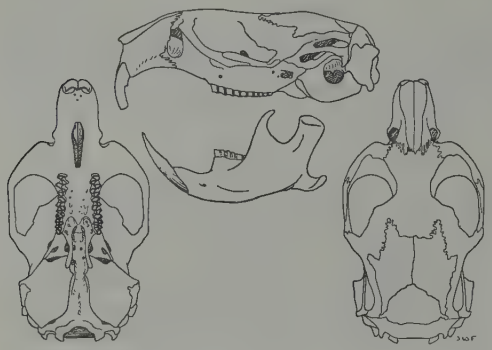


Fig. 403. *Microtus oeconomus macfarlani,* N side Salcha River, 600 ft., 25 mi. S and 20 mi. E Fairbanks, Alaska, No. 21488 K.U., ♂, X 1½.

Microtus oeconomus popofensis Merriam

1900. *Microtus unalascensis popofensis* Merriam, Proc. Washington Acad. Sci., 2:22, March 14, type from Popof Island, Shumagin Islands, Alaska. Known only from type locality.
1942. *M[icrotus]. oec[onomus]. popofensis,* Zimmermann, Archiv f. Naturgesch., 11:187, September 10.

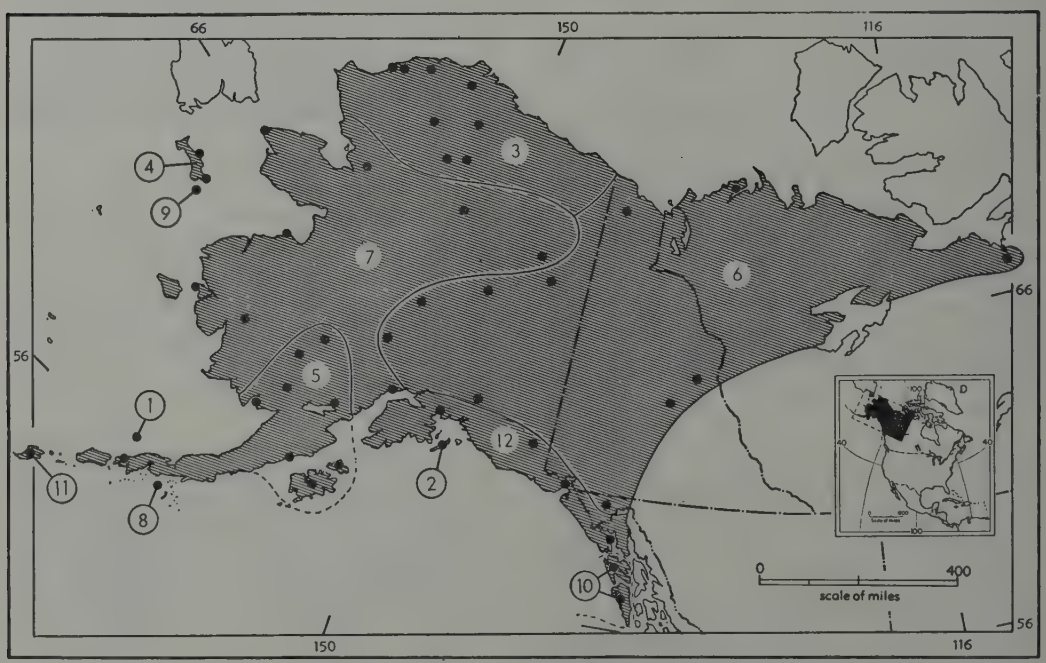
Microtus oeconomus punukensis Hall and Gilmore

1932. *Microtus innuitus punukensis* Hall and Gilmore, Univ. California Publ. Zool., 38:399, September 17, type from Big Punuk Island, near east end of St. Lawrence Island, Alaska. Known only from type locality.
1942. *M[icrotus]. oec[onomus]. punukensis,* Zimmerman, Archiv f. Naturgesch., 11:188, September 10.

Microtus oeconomus sitkensis Merriam

1897. *Microtus sitkensis* Merriam, Proc. Biol. Soc. Washington, 11:221, July 15, type from Sitka, Alaska.
1942. *M[icrotus]. oec[onomus]. sitkensis,* Zimmermann, Archiv f. Naturgesch., 11:187, September 10.

MARGINAL RECORDS (Hall and Cockrum, 1953:426). —Alaska: Chichagof Island; type locality.



Map 410. *Microtus oeconomus.*

1. *M. o. amakensis*
2. *M. o. elymocetes*
3. *M. o. gilmorei*
4. *M. o. innuitus*
5. *M. o. kadiacensis*
6. *M. o. macfarlani*
7. *M. o. operarius*
8. *M. o. popofensis*
9. *M. o. punukensis*
10. *M. o. sitkensis*
11. *M. o. unalascensis*
12. *M. o. yakutatensis*

Microtus oeconomus unalascensis Merriam

1897. *Microtus unalascensis* Merriam, Proc. Biol. Soc. Washington, 11:222, July 15, type from Unalaska, Alaska. Known only from type locality.
1942. *M[icrotus]. oec[onomus]. unalascensis,* Zimmermann, Archiv f. Naturgesch., 11:187, September 10.

Microtus oeconomus yakutatensis Merriam

1900. *Microtus yakutatensis* Merriam, Proc. Washington Acad. Sci., 2:22, March 14, type from north shore of Yakutat Bay, Alaska.
1942. *M[icrotus]. oec[onomus]. yakutatensis,* Zimmermann, Archiv f. Naturgesch., 11:187, September 10.

MARGINAL RECORDS (Hall and Cockrum, 1953:426). —Alaska [N shore] Prince William Sound; Chitina River Glacier, 4500 ft.; type locality; Glacier Bay.

Microtus longicaudus
Long-tailed Vole

External measurements: 155–221; 50–93; 20–25. Upper parts vary from dull grayish bister through brownish gray to dark sepia brown, all with mixture of numerous black-tipped hairs; sides slightly paler causing more reddish back to stand out as a wide band; venter plumbeous with light to heavy wash of whitish to dull buffy; tail long, indistinctly to distinctly bicolor, brownish to black above, soiled whitish to gray below. Body 1.6 to 1.9 times as long as tail; tail 2.8 to 3.5 times as long as hind foot; middle upper molar with four closed triangles; incisive foramina not abruptly constricted posteriorly, but gradually tapered or as wide posteriorly as anteriorly; skull relatively smooth, not heavily ridged even in adults. Embryo counts in 34 females from Wyoming averaged 4.8 (2–7), and in 39 females from Nevada 5.6 (2–8).

Microtus longicaudus abditus A. B. Howell

1923. *Microtus mordax abditus* A. B. Howell, Jour. Mamm., 4:36, February 9, type from Walker's Ranch, Pleasant Valley, 8 mi. S Tillamook, Tillamook Co., Oregon.
1938. *Microtus longicaudus abditus,* Goldman, Jour. Mamm., 19:491, November 14.

MARGINAL RECORDS (Hall and Cockrum, 1953:428). —Oregon; Netarts; type locality.

Microtus longicaudus alticola (Merriam)

1890. *Arvicola* (*Mynomes*) *alticolus* Merriam, N. Amer. Fauna, 3:67, September 11, type from Little Spring, 8200 ft., San Francisco Mtn., Coconino Co., Arizona.
1938. *Microtus longicaudus alticola,* Goldman, Jour. Mamm., 19:491, November 14.

MARGINAL RECORDS (Hall and Cockrum, 1953:428). —Utah: P.R. Springs, 43 mi. S Ouray, 7950 ft.; Warner Ranger Station, La Sal Mts., 9750 ft.; 5 mi. W Monticello. Arizona: type locality.

Microtus longicaudus angusticeps V. Bailey

1898. *Microtus angusticeps* V. Bailey, Proc. Biol. Soc. Washington, 12:86, April 30, type from Crescent City, Del Norte Co., California.
1938. *Microtus longicaudus angusticeps,* Goldman, Jour. Mamm., 19:491, November 14.

MARGINAL RECORDS (Hall and Cockrum, 1953:428). —Oregon: mouth of Rogue River. California: Mendocino.

Microtus longicaudus baileyi Goldman

1938. *Microtus longicaudus baileyi* Goldman, Jour. Mamm., 19:492, November 14, type from Greenland Spring, head of Bright Angel Creek, 8000 ft., Grand Canyon National Park, Coconino Co., Arizona.

MARGINAL RECORDS (Hall and Cockrum, 1953:428). —Arizona: Big Springs (6300–6700 ft.), Kaibab Plateau; type locality; Bright Angel Spring, Kaibab Plateau.

Microtus longicaudus bernardinus Merriam

1908. *Microtus mordax bernardinus* Merriam, Proc. Biol. Soc. Washington, 21:145, June 9, type from Dry Lake, 9000 ft., San Bernardino Mts., San Bernardino Co., California.
1938. *Microtus longicaudus bernardinus,* Goldman, Jour. Mamm., 19:492, November 14.

MARGINAL RECORDS (Hall and Cockrum, 1953: 428).—California: Bluff Lake, 7500 ft.; type locality; South Fork Santa Ana River, 8500 ft.

Microtus longicaudus halli Hayman and Holt

1931. *Microtus mordax angustus* Hall, Univ. California Publ. Zool., 37:13, April 10, type from Godman [= Goodman] Springs, 5700 ft., Blue Mts., Columbia Co., Washington. Not *Microtus angustus* Thomas, 1908.
1941. *Microtus mordax halli* Hayman and Holt, *in* Ellerman, The families and genera of living rodents, British Mus., 2:603, March 21, a renaming of *Microtus mordax angustus* Hall.
1948. *Microtus longicaudus halli,* Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 2:353, April 9.

MARGINAL RECORDS (Hall and Cockrum, 1953:428). —Washington: Humpeg [= Hornpegg] Falls; *Butte Creek; type locality.*

Microtus longicaudus latus Hall

1931. *Microtus mordax latus* Hall, Univ. California Publ. Zool., 37:12, April 10, type from Wisconsin Creek, 8500 ft., Toyabee Mts., Nye Co., Nevada.
1938. *Microtus longicaudus latus,* Goldman, Jour. Mamm., 19:491, November 14.

MARGINAL RECORDS (Hall and Cockrum, 1953:429). —Utah: Standrod, Raft River Mts., 5500 ft.; Butterfield Canyon, 3 mi. SW Butterfield Tunnel, 8000 ft.; Britts Meadow, near Delano Ranger Station, 14 mi. E Beaver; Bryce National Park; Blue Springs, Zion National Park. Nevada: 3½ mi. N Ursine, Eagle Valley, 5900 ft.; Breen Creek, Kawich Range, 7000 ft.; Chiatovich Creek, 8200 ft.; Lapon Canyon, Mt. Grant, 8800 ft.; Hardscrabble Canyon; Horse Canyon, Pahrum Peak, 5800–6000 ft.; El Dorado Canyon, Humboldt Range, 7800 ft.; Union; E side Schellbourne Pass, 6800 ft.

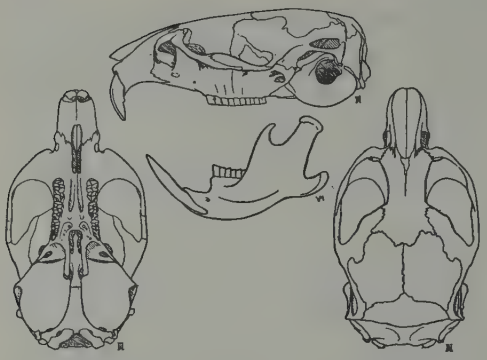


Fig. 404. *Microtus longicaudus latus*, Wisconsin Creek, 8500 ft., Nevada, No. 45846 M.V.Z., ♀, X 1½.

Microtus longicaudus leucophaeus (J. A. Allen)

1894. *Arvicola leucophaeus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 6:320, November 7, type from Graham Mts., Graham Co., Arizona. Known only from type locality.
1938. *Microtus longicaudus leucophaeus*, Goldman, Jour. Mamm., 19:491, November 14.

Microtus longicaudus littoralis Swarth

1933. *Microtus mordax littoralis* Swarth, Proc. Biol. Soc. Washington, 46:209, October 26, type from Shakan, Prince of Wales Island, Alaska [Shakan is on Kosciusko Island and Swarth probably took his specimen on Prince of Wales Island, opposite Shakan].
1938. *Microtus longicaudus littoralis*, Goldman, Jour. Mamm., 19:491, November 14.

MARGINAL RECORDS (Hall and Cockrum, 1953:429, unless otherwise noted).—Alaska: Yakutat; [Point Gustavus] Glacier Bay; E side Chilkat River, 100 ft., 9 mi. W, 4 mi. N Haines; Juneau; Sundum. British Columbia (Cowan and Guiguet, 1956:227): Telegraph Creek; Flood Glacier. Alaska: Thomas Bay; Bradfield Canal; Dall Island.

Microtus longicaudus longicaudus (Merriam)

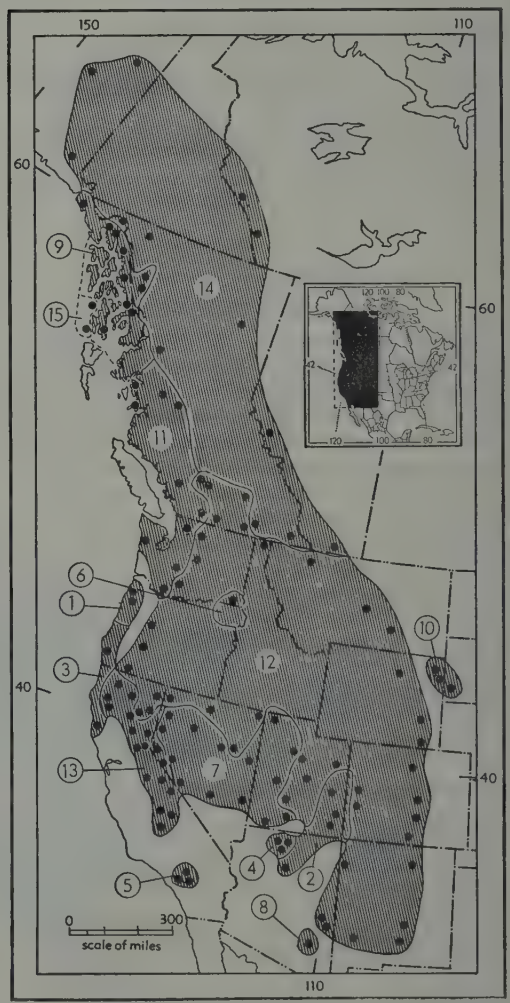
1888. *Arvicola* (*Mynomes*) *longicaudus* Merriam, Amer. Nat., 22:934, October, type from Custer, 5500 ft., Black Hills, Custer Co., South Dakota.
1895. *Microtus* (*Mynomes*) *longicaudus*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:266, August 21.

MARGINAL RECORDS (Hall and Cockrum, 1953:429).—Wyoming: 3 mi. NW Sundance. South Dakota: type locality. Wyoming: 1½ mi. E Buckhorn, 6150 ft.

Microtus longicaudus macrurus Merriam

1898. *Microtus macrurus* Merriam, Proc. Acad. Nat. Sci. Philadelphia, 50:353, October 4, type from Lake Cushman, Olympic Mts., Mason Co., Washington.
1938. *Microtus longicaudus macrurus*, Goldman, Jour. Mamm., 19:491, November 14.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:227, unless otherwise noted): Princess Royal Island; Kimsquit (Hall and Cockrum, 1953:429); Rainbow Mts.; Alta Lake (Hall and Cockrum, 1953:429); Silver Creek near Hope. Washington (Hall and Cockrum, 1953: 429): Sauk; Naches River; Wind River; Granville [= Taholah], and thence along coast to point of beginning, including in British Columbia (see Cowan and Guiguet, 1956: 227), *Stuart, Goose, King,* and *Swindle* islands.



Map 411. *Microtus longicaudus* and *Microtus coronarius*.

Guide to kinds
1. *M. l. abditus*
2. *M. l. alticola*
3. *M. l. angusticeps*
4. *M. l. baileyi*
5. *M. l. bernardinus*
6. *M. l. halli*
7. *M. l. latus*
8. *M. l. leucophaeus*
9. *M. l. littoralis*
10. *M. l. longicaudus*
11. *M. l. macrurus*
12. *M. l. mordax*
13. *M. l. sierrae*
14. *M. l. vellerosus*
15. *M. coronarius*

Microtus longicaudus mordax (Merriam)

1891. *Arvicola* (*Mynomes*) *mordax* Merriam, N. Amer. Fauna, 5:61, July 30, type from Sawtooth (or Alturas) Lake, 7200 ft., east base of Sawtooth Mts., Blaine Co., Idaho.
1938. *Microtus longicaudus mordax*, Goldman, Jour. Mamm., 19:491, November 14.

MARGINAL RECORDS (Hall and Cockrum, 1953:430, unless otherwise noted).—British Columbia (Cowan and Guiguet, 1956:228): Shuswap; Cascade. Idaho: 4 mi. W Meadow Creek. Montana: Blackfoot; Big Snowy Mts.; Fort Custer. Wyoming: 5½ mi. W, 2 mi. S Buffalo, 5620 ft.; 3 mi. N, 5 mi. E Orin, 4725 ft.; 3¾ mi. W Horse Creek P.O., 7000 ft. Colorado: Estes Park; Lake Moraine; Canyon City; Fort Garland. New Mexico: Martinez; Capitan Mts.; [Cloudcroft] Sacramento [Mts.]; [Kingston] Mimbres Mts. Arizona: Rose Peak; Reservation Creek, 9640 ft. New Mexico: Chuska Mts. Colorado: tributary of San Miguel River, near Coventry, 5500 ft.; Grand Junction, 4600 ft. Utah: Vernal, 5300 ft.; Lake Creek, 11 mi. E Mount Pleasant; Wildcat Ranger Station, Boulder Mtn., 8700 ft.; 3¾ mi. NE Pleasant Grove. Nevada: Goose Creek, 2 mi. W Utah boundary, 5000 ft.; W side Ruby Lake, 3 mi. S Elko Co. line, 6100 ft.; Hansen Canyon, 5 mi. W Paradise Valley, 6200 ft.; 2 mi. W Vya, 6500 ft. California: 5 mi. N Fredonyer Peak, 5700 ft.; Butte Lake, 6100 ft.; Parker Creek (5000–5500 ft.); Goose Lake, 5150 ft. Oregon: Siskiyou; Upper Deschutes River, Little Meadow (near head of Deschutes River); 15 mi. W Bend. Washington: 8 mi. S Glenwood, base Mt. Adams; 2 mi. S Blewett Pass, 3000 ft.; Hart Lake, Railroad Creek, 3900 ft. British Columbia (Cowan and Guiguet, 1956:228): Manning Park; Spences Bridge; Blackwater Lake; *McGillivary Creek*.

Microtus longicaudus sierrae R. Kellogg

1922. *Microtus mordax sierrae* R. Kellogg, Univ. California Publ. Zool., 21:288, April 18, type from Tuolumne Meadows, 8600 ft., Yosemite National Park, California.
1938. *Microtus longicaudus sierrae*, Goldman, Jour. Mamm., 19:491, November 14.

MARGINAL RECORDS (Hall and Cockrum, 1953:430).—California: Etna; Bear Creek; Lassen Peak; Sierra Valley, 5100 ft.; Independence Lake, 7000 ft. Nevada: ½ mi. S Mt. Rose, 9500 ft.; *½ mi. S Marlette Lake, 8150 ft.*; Desert Creek, Sweetwater Range, 6250 ft. California: Farringtons Ranch near Mono Lake, 6800 ft., McCloud Camp, Cottonwood Creek, White Mts., 9200 ft.; *Roberts Ranch, Wyman Creek, White Mts., 8250 ft.*; Monache Meadow, 8000 ft.; Taylor Meadow; Hume, 5300 ft.; El Portal, 2000 ft.; Blue Cañon (4700–5000 ft.); 20 mi. SW Quincy, 5000 ft.; head Bear Creek, 6400 ft.; head Grizzly Creek, 6000 ft.

Microtus longicaudus vellerosus J. A. Allen

1899. *Microtus vellerosus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 12:7, March 4, type from upper Liard River, British Columbia.
1944. *Microtus longicaudus vellerosus*, Anderson and Rand, Canadian Field-Nat., 58:20, April 1.
1899. *Microtus cautus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 12:7, March 4, type from Hells Gate, Liard River, British Columbia.

MARGINAL RECORDS (Hall and Cockrum, 1953:431).—Alaska: Circle. Mackenzie: Glacier Lake; Nahanni Gates. British Columbia: Sikanni Chief River. Alberta: Jasper Park; Sweet Grass Hills. British Columbia: Newgate; Rossland; Nine Mile Mtn. [4500 ft., NE Hazleton]; Atlin. Alaska: Skagway; Chitina River Glacier; N side Salcha River, 600 ft., 25 mi. S and 20 mi. E Fairbanks.

Microtus coronarius Swarth
Coronation Island Vole

1911. *Microtus coronarius* Swarth, Univ. California Publ. Zool., 7:131, January 12, type from Egg Harbor, Coronation Island, Alaska.

External measurements: 203–232; 70–92; 24–26. Upper parts Vandyke brown obscured by black-tipped hairs; sides paler, near broccoli brown; venter dark gray; tail bicolor, blackish above, whitish below. This species is closely related to *M. longicaudus*.

MARGINAL RECORDS (Hall and Cockrum, 1953:431).—Alaska: type locality; *Warren Island*; Forrester Island.

Microtus mexicanus
Mexican Vole

External measurements: 121–152; 24–35; 17–21; 12–15. Weight, 26–43.4 grams. Pelage coarse and lax; upper parts cinnamon buff to dark cinnamon brown, with mixture of black hairs resulting in grizzled-brownish color; sides paler; venter washed with grayish buff to cinnamon, sometimes whitish; tail slightly bicolor, dusky to dark brown above, paler below; incisive foramina short, wide, and truncate posteriorly. Body 3.3 to 3.8 times as long as tail; tail only 1.5 to 1.7 times as long as hind foot; mammae 1–1 = 4; anterior lower molar (m1) with extra anterior trefoil. Counts of embryos in 19 females from Mexico ranged from 1 to 4 and averaged 2.7.

Microtus mexicanus fundatus Hall

1948. *Microtus mexicanus fundatus* Hall, Univ. Kansas Publ., Mus. Nat. Hist., 1:425, December 24, type from 3½ mi. S Pátzcuaro, 7900 ft., Michoacán.

MARGINAL RECORDS.—Michoacán: Nahuatzen (Hall and Cockrum, 1953:432); 10 mi. SE Pátzcuaro, 9200 ft. (Hooper, 1955:24); *6 mi. S Pátzcuaro, 8000 ft.* (*ibid.*).

Microtus mexicanus guadalupensis V. Bailey

1902. *Microtus mexicanus guadalupensis* V. Bailey, Proc. Biol. Soc. Washington, 15:118, June 2, type from Guadalupe Mts., 7800 ft., El Paso Co., Texas.

MARGINAL RECORDS (Hall and Cockrum, 1953:433).—New Mexico: Manzano Mts.; Capitan Mts. Texas: The Bowl, 8000 ft., Guadalupe Mts. New Mexico: Sacramento Mts.

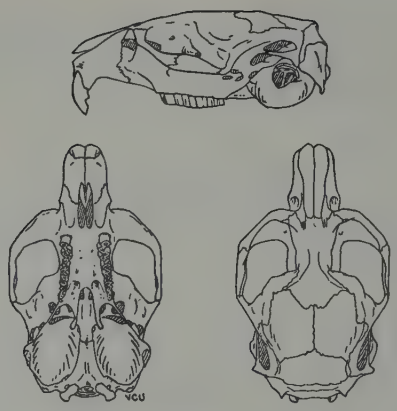


Fig. 405. *Microtus mexicanus fundatus*, 3¾ mi. S Pátzcuaro, 7900 ft., Michoacán, No. 100637 M.V.Z., ♂, X 1½.

Microtus mexicanus hualpaiensis Goldman

1938. *Microtus mexicanus hualpaiensis* Goldman, Jour. Mamm., 19:493, November 14, type from Hualpai Peak, 8400 ft., Hualpai Mts., Mohave Co., Arizona. Known only from type locality.

Microtus mexicanus madrensis Goldman

1938. *Microtus mexicanus madrensis* Goldman, Jour. Mamm., 19:493, November 14, type from Río Gavilán, 6700 ft., 5 mi. W Colonia García, about 60 mi. SW Casas Grandes, Chihuahua.

MARGINAL RECORDS (Hall and Cockrum, 1953:433).—Chihuahua: type locality; Sierra Madre, near Guadalupe y Calvo.

Microtus mexicanus mexicanus (Saussure)

1861. *Arvicola* (*Hemiotomys*) *mexicanus* Saussure, Revue et Mag. Zool., Paris, ser. 2, 13:3, January, type from Volcán de Orizaba, Puebla.
1897. [*Microtus*] *mexicanus*, Trouessart, Catalogus mammalium . . . , p. 564.

MARGINAL RECORDS (Hall and Cockrum, 1953:433).—Hidalgo: Sierra de Pachuca. Veracruz: 3 km. E Las Vigas, 8000 ft.; Mt. Orizaba. Puebla: Chalchicomula. México: N slope Volcán de Toluca.

Microtus mexicanus mogollonensis (Mearns)

1890. *Arvicola mogollonensis* Mearns, Bull. Amer. Mus. Nat. Hist., 2:283, February 21, type from Bakers Butte, Mogollon Mts., Coconino Co., Arizona.
1932. *Microtus mexicanus mogollonensis*, V. Bailey, N. Amer. Fauna, 53:204, March 1.

MARGINAL RECORDS (Hall and Cockrum, 1953:433, unless otherwise noted).—Colorado: head of Spruce Tree Canyon, Mesa Verde National Park (Rodeck and Anderson, 1956:436). New Mexico: Fort Wingate; Mt. Taylor; Magdalena Mts.; E slope Mimbres Mts. near Kingston. Arizona: type locality; Agassiz Peak, 11,500 ft.

Microtus mexicanus navaho Benson

1934. *Microtus mexicanus navaho* Benson, Proc. Biol. Soc. Washington, 47:49, February 9, type from Soldier Spring, 8800 ft., E slope Navajo Mtn., San Juan Co., Utah.

MARGINAL RECORDS (Hall and Cockrum, 1953:433).—Utah: type locality. Arizona: *5 mi. E Rainbow Lodge, Navajo Mtn.*

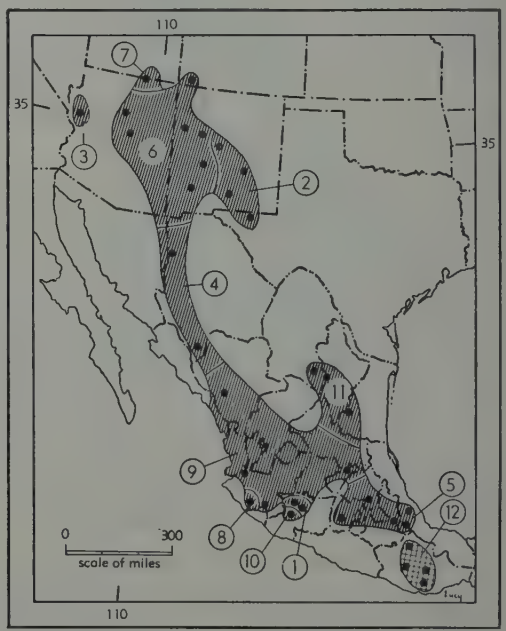
Microtus mexicanus neveriae Hooper

1955. *Microtus mexicanus neveriae* Hooper, Occas. Papers Mus. Zool., Univ. Michigan, 565:23, March 31, type from mountains about 20 mi. SE Autlán, near lumber mill of La Nevería, 8200 ft., Jalisco.

MARGINAL RECORDS (Hooper, 1955:24–25).—Jalisco: *mts. S Autlán, 9000 ft.*; type locality; *20 mi. SSE Autlán, 6500 ft.*

Microtus mexicanus phaeus (Merriam)

1892. *Arvicola phaeus* Merriam, Proc. Biol. Soc. Washington, 7:171, September 29, type from N slope El Nevado de Colima, 10,000 ft., Jalisco.
1900. *Microtus mexicanus phaeus*, V. Bailey, N. Amer. Fauna, 17:54, June 6.



Map 412. *Microtus mexicanus* and *Microtus fulviventer*.

1. *M. m. fundatus*
2. *M. m. guadalupensis*
3. *M. m. hualpaiensis*
4. *M. m. madrensis*
5. *M. m. mexicanus*
6. *M. m. mogollonensis*
7. *M. m. navaho*
8. *M. m. neveriae*
9. *M. m. phaeus*
10. *M. m. salvus*
11. *M. m. subsimus*
12. *M. fulviventer*

MARGINAL RECORDS (Hall and Cockrum, 1953:434, unless otherwise noted).—Durango: El Salto. Querétaro: Pinal de Amoles. Jalisco: type locality; *El Nevado de Colima, NW slope, 8000 ft.* (Hooper, 1955:25); 10 mi. W, 9 mi. N Magdalena.

Microtus mexicanus salvus Hall

1948. *Microtus mexicanus salvus* Hall, Univ. Kansas Publ., Mus. Nat. Hist., 1:426, December 24, type from Mt. Tancítaro, 11,400 ft., Michoacán. Known only from Mt. Tancítaro at elevations of 7800 to 11,400 ft.

Microtus mexicanus subsimus Goldman

1938. *Microtus mexicanus subsimus* Goldman, Jour. Mamm., 19:494, November 14, type from Sierra Guadalupe, southeastern Coahuila.

MARGINAL RECORDS (Hall and Cockrum, 1953:434).—Coahuila: type locality; 12 mi. E Antonio de las Alazanas. Tamaulipas: mountains near Miquihuana.

Microtus fulviventer Merriam
Oaxacan Vole

1898. *Microtus fulviventer* Merriam, Proc. Biol. Soc. Washington, 12:106, April 30, type from Cerro San Felipe, 10,200 ft., Oaxaca.

Average external measurements of 10 adult topotypes are: 152; 35; 20.4. Upper parts umber brown, darkened by black-tipped hairs; underparts fulvous or dull chestnut brown; tail dusky brown above, fulvous below. This nominal species is closely related to *M. mexicanus*.

MARGINAL RECORDS (Hall and Cockrum, 1953:434).—Oaxaca: Reyes [Pápalo Santos Reyes]; Mt. Zempoaltepec; mountains near Ozolotepec; 15 mi. W Oaxaca.

Microtus chrotorrhinus
Rock Vole

Reviewed by Komarek, Jour. Mamm., 13:155–158, May 11, 1932.

External measurements: 137–170; 45–50; 19.4–22. Upper parts grayish bister to bright glossy bister, lined with black-tipped hairs; face, especially from eyes to nose, yellowish to dull orange rufous; venter plumbeous, sometimes with thin whitish wash; tail slightly bicolor, grayish brown to brownish above, paler below, body 2.4 to 2.7 times as long as tail; tail 2.0 to 2.5 times as long as hind foot; M3 with 5 closed triangles; incisive foramina short and wide. Specimens from localities between the known geographic ranges of *M. chrotorrhinus* and *M. xanthognathus* are needed to show whether the two kinds are two species or only subspecies of one species.

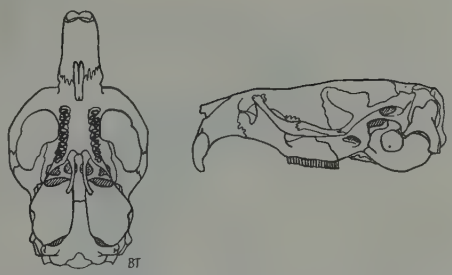


Fig. 406. *Microtus chrotorrhinus chrotorrhinus*, summit Mt. Washington, New Hampshire, No. 150181 U.S.N.M., ♀, X 1½.

Microtus chrotorrhinus carolinensis Komarek

1932. *Microtus chrotorrhinus carolinensis* Komarek, Jour. Mamm., 13:158, May 11, type from Great Smoky Mts. of North Carolina, about five miles (airline distance) north of Smokemont, Swain Co., on a tributary of Bradley Fork, a small branch of the Oconalufty River, 3200 ft.

MARGINAL RECORDS (Hall and Cockrum, 1953:436).—West Virginia: Randolph County. North Carolina: type locality. Tennessee: Dry Sluice Trail, 4300 ft., near divide (Mt. Collins).

Microtus chrotorrhinus chrotorrhinus (Miller)

1894. *Arvicola chrotorrhinus* Miller, Proc. Boston Soc. Nat. Hist., 26:190, March 24, type from head of Tuckerman's Ravine, 5300 ft., Mt. Washington, Coos Co., New Hampshire.

1896. *Microtus chrotorrhinus*, Bangs, Proc. Biol. Soc. Washington, 10:49, March 9.

MARGINAL RECORDS (Hall and Cockrum, 1953:437).—Quebec: Seal River; Mt. Albert, 3500 ft.; New Derreen. New Brunswick: Trousers Lake. Maine: Mt. Coburn, about 12 mi. N The Forks. New Hampshire: type locality. New York: Hunter Mtn. Pennsylvania: near Sonestown. New York: Beedes [= Breed's]. Ontario: Timagami; Pancake Bay. Minnesota: Burntside Lake. Ontario: near Lowbush, Lake Abitibi. Quebec: Mistassini Lake area.

Microtus chrotorrhinus ravus Bangs

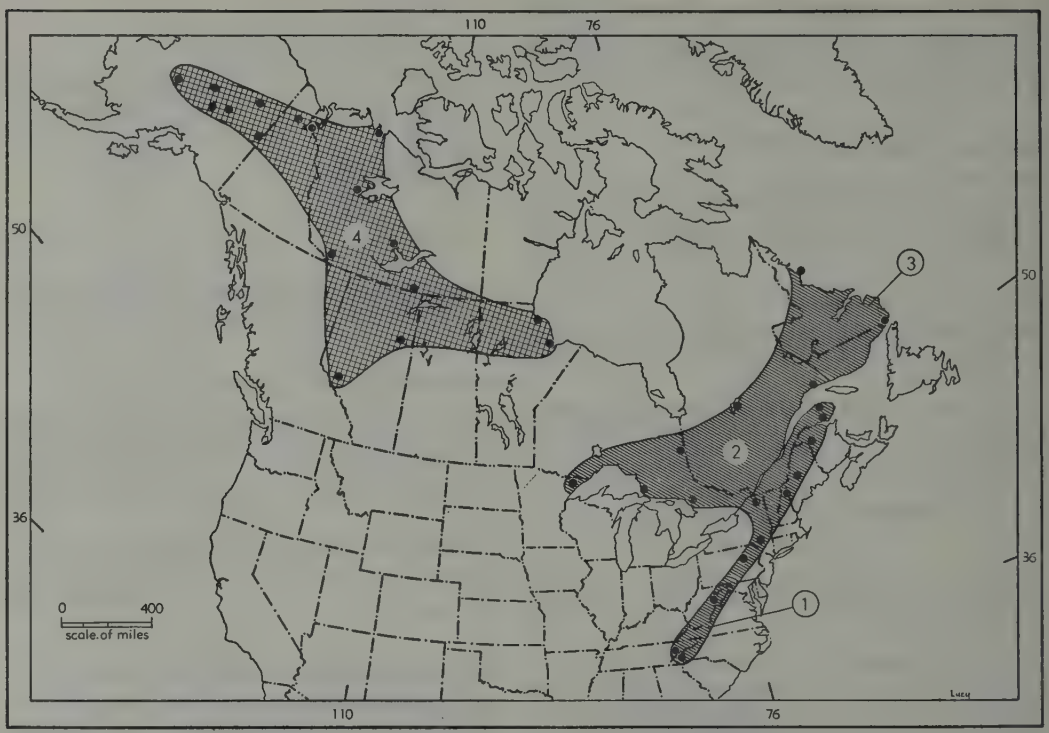
1898. *Microtus chrotorrhinus ravus* Bangs, Proc. Biol. Soc. Washington, 12:188, November 16, type from Black Bay, Strait of Belle Isle, Labrador.

MARGINAL RECORDS (Hall and Cockrum, 1953:437).—Labrador: Port Manvers; type locality.

Microtus xanthognathus (Leach)
Yellow-cheeked Vole

1815. *Arvicola xanthognatha* Leach, Zool. Miscell., 1:60, type from Hudson Bay.

1896. *M[icrotus]. xanthognathus*, Miller, N. Amer. Fauna, 12:66, July 23.



Map 413. *Microtus chrotorrhinus* and *Microtus xanthognathus.*

1. *M. chrotorrhinus carolinensis*
2. *M. chrotorrhinus chrotorrhinus*
3. *M. chrotorrhinus ravus*
4. *M. xanthognathus*

External measurements: 186–226; 45–53; 24–27. Large adults weigh as much as 170 grams. Upper parts dark sepia to bister, heavily lined with coarse black hairs on back; sides of nose and ear patch bright rusty yellowish; venter dusky gray; tail indistinctly bicolor, blackish above, dusky gray below; body 3.2 to 3.8 times as long as tail; tail 1.8–1.9 times as long as hind foot; M3 with only 3 closed triangles; middle section of m3 frequently divided into 2 nearly closed triangles; incisive foramina long and narrow. As many as 11 embryos have been found in one female.

MARGINAL RECORDS (Hall and Cockrum, 1953:434).—Mackenzie: Arctic coast [Franklin Bay] east of Fort Anderson; Fort Franklin; Fort Rae; Fort Smith. Manitoba: Fort Churchill; Nelson River. Alberta: Athabaska River, 30 mi. above Pelican Portage; Cache Pecotte, 40 mi. E Jasper House. Mackenzie: Liard River. Alaska: Eagle; south of Fairbanks; Toklat River, McKinley National Park; near mouth Takotna River; Yukon 200 mi. SW of mouth of Porcupine; mouth of Porcupine River. Yukon: La Pierre House. Mackenzie: Fort McPherson.

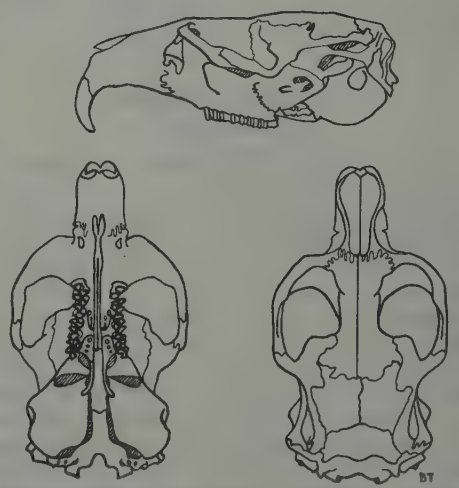


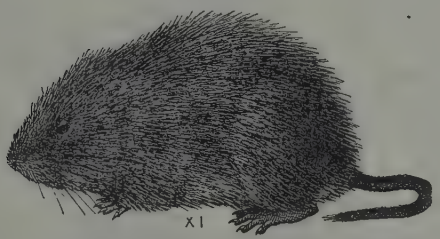
Fig. 407. *Microtus xanthognathus,* Fort Smith, Mackenzie, No. 109370 U.S.N.M., ♂, X 1½.

Subgenus Aulacomys Rhoads

1894. *Aulacomys* Rhoads, Amer. Nat., 28:182, February. Type, *Aulacomys arvicoloides* Rhoads.

Plantar tubercles, 5; side glands on flanks of males conspicuous; musk-bearing anal gland; feet large; tail long; fur full and long; bullae small; incisors projecting far beyond premaxillae; molars with constricted and tightly closed sections; M2 with 4 closed sections; M3 with 3 closed triangles; m1 with 5 closed triangles; m3 with 3 transverse loops.

Microtus richardsoni
Water Vole



External measurements: 198–261; 69–92; 25–30; 15–20. Weight of 2 adult males, 112, 123.3 grams. Pelage long; upper parts grayish sepia to dark sepia or dark reddish brown, often darkened with black-tipped hairs; underparts plumbeous, with white or silvery white wash; tail bicolor, dusky above, grayish below; other characters as given above for the subgenus. Number of embryos varies from 4 to 7.

Microtus richardsoni arvicoloides (Rhoads)

1894. *Aulacomys arvicoloides* Rhoads, Amer. Nat., 28:182, February, type from Lake Keechelus, 8000 ft. Kittitas Co., Washington. (Inferentially regarded as indistinguishable from *M. r. richardsoni* by Cowan and Guiguet, Handbook No. 11, British Columbia Provincial Mus., pp. 215–217, 222, July 15, 1956.)

1900. *Microtus richardsoni arvicoloides*, V. Bailey, N. Amer. Fauna, 17:62, June 6.

1895. *Microtus principalis* Rhoads, Amer. Nat., 29:940, October, type from Mt. Baker Range, British Columbia.

MARGINAL RECORDS (Hall and Cockrum, 1953:437–438, unless otherwise noted).—British Columbia (Cowan and Guiguet, 1956:217, as *M. r. richardsoni*): Gold Bridge; Hope-Princeton summit. Washington: Wenatchee. Oregon: Mt. Hood; Mt. Jefferson; Crater Lake; *Prospect*; Detroit. Washington: Mt. St. Helens. British Columbia: Lihumitson Mtn. (Cowan and Guiguet, 1956:217, as *M. r. richardsoni*); Avalanche Pass.

Microtus richardsoni macropus (Merriam)

1891. *Arvicola* (*Mynomes*) *macropus* Merriam, N. Amer. Fauna, 5:60, July 30, type from Pahsimeroi Mts., 9700 ft.,

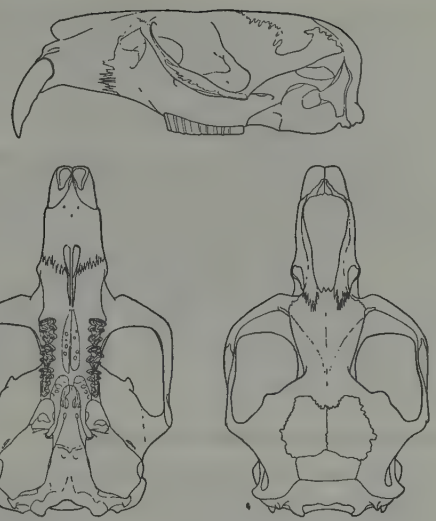
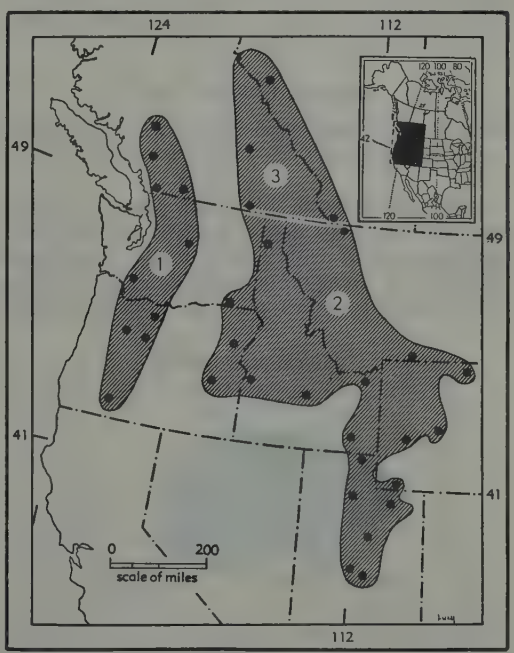


Fig. 408. *Microtus richardsoni arvicoloides*, Tumalo Creek, 6100 ft., 15 mi. W Bend, Deschutes Co., Oregon, No. 83968 M.V.Z., ♂, X 1½.



Map 414. Subspecies of *Microtus richardsoni*.
1. *arvicoloides* 2. *macropus* 3. *richardsoni*

Custer Co., Idaho. (Regarded as indistinguishable from *richardsoni* by Anderson and Rand, Canadian Field-Nat., 57:106, December 10, 1943; but regarded as distinguishable by Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 2:356, April 9, 1948.)

1900. *Microtus richardsoni macropus*, V. Bailey, N. Amer. Fauna, 17:61, June 6.

MARGINAL RECORDS (Hall and Cockrum, 1953:438–439).—Montana: 1 mi. W, 2 mi. S Summit; Beartooth Mts. Wyoming: Medicine Wheel Ranch, 9000 ft., 28 mi. E Lovell; South Pass City; LaBarge Creek; 9 mi. S Robertson, 8400 ft. Utah: Petty Mtn., 15 mi. N Mountain Home, 9000 ft.; 11 mi. E Mt. Pleasant; Elkhorn Guard Station, 14 mi. N Torrey, Fish Lake Plateau, 9400 ft.; Fish Lake Mts.; Lambs Canyon, 13 mi. SE Salt Lake City; 12 mi. W Garden City. Idaho: Camp Tendoy; Mt. Jefferson, 3 mi. S Montana line; Alturas Lake; SW slope Cuddy Mtn. Oregon: Strawberry Butte; Wallowa Mts. Washington: Stay-a-while Spring. Idaho: Priest Lake.

Microtus richardsoni richardsoni (DeKay)

1842. *A[rvicola]. richardsoni* DeKay, Zoology of New York, Mammals, p. 91, type from "near the foot of the Rocky Mountains." According to V. Bailey (N. Amer. Fauna, 17:60, June 6, 1900) the type was obtained by Drummond in the vicinity of Jasper House, Alberta.

1897. [*Microtus*] *richardsoni*, Trouessart, Catalogus mammalium . . . , p. 565.

MARGINAL RECORDS.—Alberta (Hall and Cockrum, 1953:439): 5 mi. W Henry House; Waterton Lake Park. British Columbia (Cowan and Guiguet, 1956:217): Rossland; Mt. Revelstoke; *latitude of Mt. Robson.*

Subgenus Chilotus Baird

1858. *Chilotus* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):516, July 14. Type, *Arvicola oregoni* Bachman.

Plantar tubercles, 5; side glands obscure or wanting; ears small; fur dense and without stiff hairs; molars small; M3 with 2 or 3 closed triangles; m1 with 5 closed triangles; m2 with anterior pair of triangles usually confluent; m3 with 3 transverse loops.

Microtus oregoni
Creeping Vole

Reviewed by Hatfield and Hooper, Murrelet, 16:33–34, May, 1935.

External measurements: 129–154; 32–42; 16–19; 9–10. Average weights of 10 males and 10 females, respectively, of *M. o. oregoni*, 19.3, 19.1 grams. Upper parts varying from sooty gray through mixed bister to yellowish bister; underparts dusky with wash varying from dull buff to whitish; tail indistinctly bicolor, sooty to blackish above, dark gray to silvery gray below; ears blackish, scantily haired, and protruding from fur. Embryos 3 to 5.

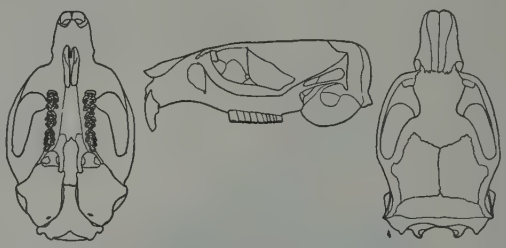


Fig. 409. *Microtus oregoni oregoni*, 1½ mi. S, ½ mi. E Willow Creek, 600 ft., Humboldt Co., California, No. 97516 M.V.Z., ♂, X 1½.

Microtus oregoni adocetus Merriam

1908. *Microtus oregoni adocetus* Merriam, Proc. Biol Soc. Washington, 21:145, June 9, type from 2 mi. S South Yolla Bolly Mtn., 7500 ft., Tehama Co., California.

MARGINAL RECORDS (Hall and Cockrum, 1953:439).—Oregon: Belmont Orchard, 6 mi. S Medford. California: type locality; Blake Lookout on South Fort Mtn.

Microtus oregoni bairdi Merriam

1897. *Microtus bairdi* Merriam, Proc. Biol. Soc. Washington, 11:74, April 21, type from Glacier Peak, 7800 ft., Crater Lake, Klamath Co., Oregon.

1920. *Microtus oregoni bairdi*, Taylor, Jour. Mamm., 1:180, August 24.

MARGINAL RECORDS (Hall and Cockrum, 1953:441).—Oregon: type locality. California: Beswick.

Microtus oregoni oregoni (Bachman)

1839. *Arvicola oregoni* Bachman, Jour. Acad. Nat. Sci. Philadelphia, 8(1):60, type from Astoria, Clatsop Co., Oregon.

1896. *Microtus oregoni*, Miller, N. Amer. Fauna, 12:9, July 23.

1899. *Microtus morosus* Elliot, Field Columb. Mus., Publ. 30, Zool. Ser., 1:227, February 2, type from Boulder Lake, 5000 ft., Olympic Mts., Clallam Co., Washington.

1920. *Microtus oregoni cantwelli* Taylor, Jour. Mamm., 1:180, August 24, type from Glacier Basin, 5935 ft., Mt. Rainier, Pierce Co., Washington (see Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 2:357, April 9, 1948, who regards *M. o. cantwelli* as inseparable from *M. o. oregoni*).

MARGINAL RECORDS (Hall and Cockrum, 1953:441).—Washington: Mt. Vernon; Stehekin, head of Lake Chelan; Entiat River, 20 mi. from mouth; Mt. Aix, head of Hindoo Creek, Signal Peak. Oregon: N base Three Sisters, 5000 ft.;

Elk Head. California: Hoopa Valley; Mendocino City, thence north along coast to point of beginning.

Microtus oregoni serpens Merriam

1897. *Microtus serpens* Merriam, Proc. Biol. Soc. Washington, 11:75, April 21, type from Agassiz, British Columbia.
1920. *M[icrotus]. o[regoni]. serpens,* Taylor, Jour. Mamm., 1:180, August 24.

MARGINAL RECORDS (Cowan and Guiguet, 1956: 215).—British Columbia: Port Moody; type locality; Allison Pass; Huntingdon.

Map 415. *Microtus oregoni.*

1. *M. o. adocetus*
2. *M. o. bairdi*
3. *M. o. oregoni*
4. *M. o. serpens*

Subgenus Stenocranius Kastschenko

1901. *Stenocranius* Katschenko, Ann. Mus. Zool. Acad. Sci., St. Pétersbourg, 6:167. Type, *Microtus slowzowi* Poljakoff [= *Mus gregalis* Pallas].

Dentition normal but skull unusually narrow; median crest sharp; claws tend to be enlarged; ears small.

Microtus miurus
Singing Vole

External measurements: 101–155; 19–41; 19–21; 10–14. Weight, 22–52.1 grams. Upper parts vary from pale buffy gray through pale ochraceous to pale tawny, lightly mixed with buffy-tipped to black-tipped guard hairs; venter whitish gray to buffy; tail dusky above, buffy to ochraceous below.

Microtus miurus andersoni Rand

1945. *Microtus andersoni* Rand, Bull. Nat. Mus. Canada, 99:42, prior to June 20, type from near headwaters of Little Keele River, 5500 ft., 82 mi. west of Mackenzie River on Canol Road, Mackenzie. Known only from type locality.
1952. *Microtus miurus andersoni,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:312, November 17.

Microtus miurus cantator Anderson

1947. *Microtus cantator* Anderson, Bull. Nat. Mus. Canada, 102:161, January 24, type from mountain top near Tepee Lake, lat. 61° 35′ N, long. 140° 22′ W, N slope Saint Elias Range, Yukon.
1952. *Microtus miurus cantator,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:312, November 17.

MARGINAL RECORDS (Hall and Cockrum, 1953:442).—Alaska: Fish Creek, 3400 ft., 5 mi. N, 1 mi. E Paxson. Yukon: type locality.

Microtus miurus miurus Osgood

1901. *Microtus miurus* Osgood, N. Amer. Fauna, 21:64, September 26, type from head of Bear Creek, in mts. near Hope City, Turnagain Arm, Cook Inlet, Alaska. Known only from type locality.

Microtus miurus muriei Nelson

1931. *Microtus muriei* Nelson, Jour. Mamm., 12:311, August 24, type from Kutuk River (tributary of Alatna River), Endicott Mts., Alaska.

Fig. 410. *Microtus miurus muriei,* Chandler Lake, lat. 68° 12′ N, long. 152° 45′ W, 2900 ft., Alaska, No. 43758 K.U., ♀, X 1½.

1952. *Microtus miurus muriei*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:312, November 17.

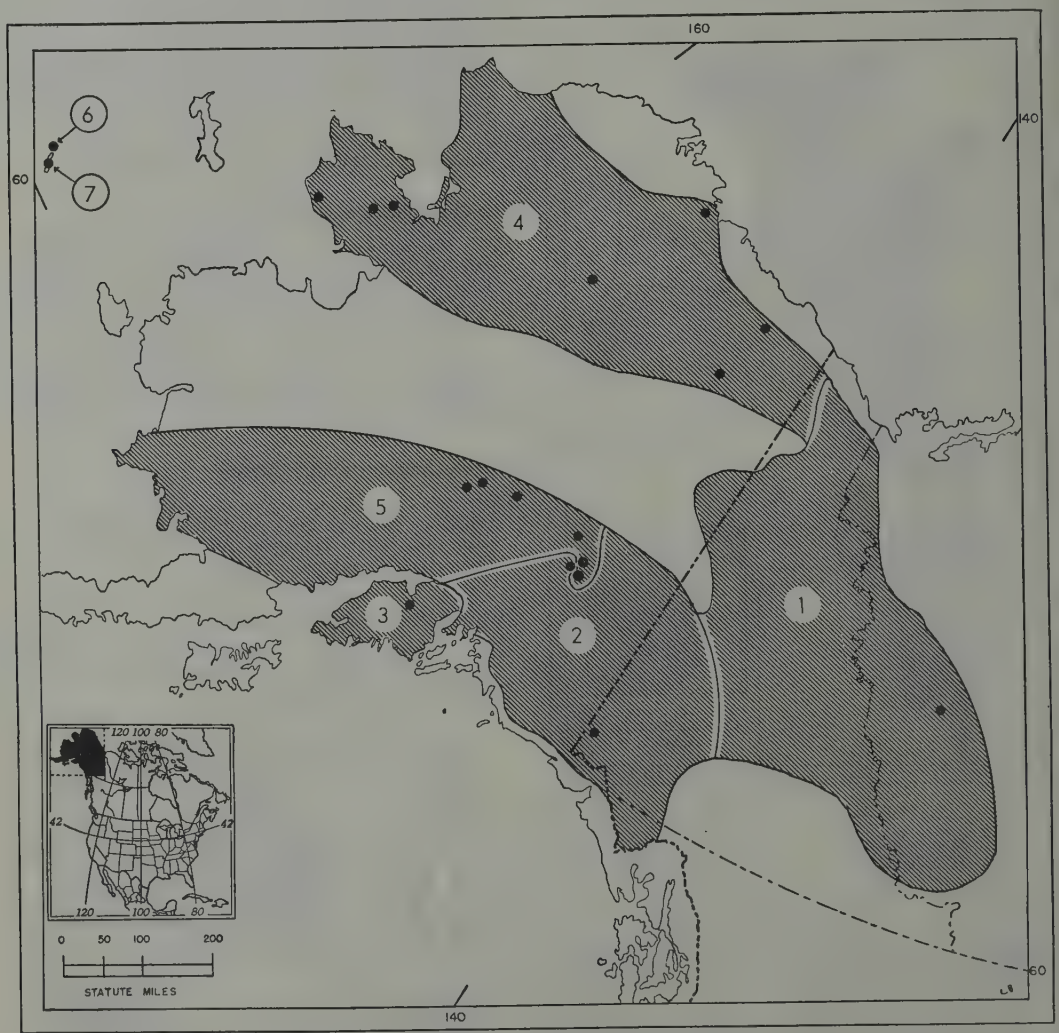
1950. *Microtus miurus paneaki* Rausch, Jour. Washington Acad. Sci., 40:135, April 21, type from Tolugak Lake (lat. 68° 24′ N, long. 152° 10′ W), Brooks Range, Alaska (regarded as inseparable from *M. m. muriei* by Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:311, November 17, 1952).

MARGINAL RECORDS (Hall and Cockrum, 1953:443, unless otherwise noted).—Alaska: Fish Creek, SE of Teshekpuk Lake (Bee and Hall, 1956:156); Lake Schrader; Arctic Village; type locality; *Kuzitrin Lake*; Anvil Peak, Cooper Gulch; Lava Lake; Magnet Creek.

Microtus miurus oreas Osgood

1907. *Microtus miurus oreas* Osgood, Proc. Biol. Soc. Washington, 20:61, April 18, type from Toklat River, Alaskan Range, Alaska.

MARGINAL RECORDS (Hall and Cockrum, 1953:443, unless otherwise noted).—Alaska: Jarvis Creek; Gakona Glacier (Strecker, *et al.*, 1952:479); Swede Lake (*ibid.*); N side Mt. McKinley; Glacier Creek; Savage River.



Map 416. *Microtus miurus* and *Microtus abbreviatus*.

Guide to kinds
1. *M. miurus andersoni*
2. *M. miurus cantator*
3. *M. miurus miurus*
4. *M. miurus muriei*
5. *M. miurus oreas*
6. *M. abbreviatus abbreviatus*
7. *M. abbreviatus fisheri*

Microtus abbreviatus
Insular Vole

External measurements: 160–178; 25–32; 22–24. Fur long, concealing ears; upper parts yellowish brown to rich dark buff, sprinkled with black-tipped hairs; underparts creamy white to strong, clear buff; tail sharply or slightly bicolored, a narrow line of dusky to dark brownish above, creamy to buff below. This species is included in the subgenus *Stenocranius* on the authority of Nelson (Jour. Mamm., 12:311, August 24, 1931) and R. M. Gilmore (Abstracts of theses . . . , 1942 Cornell Univ., p. 289, 1943).

Microtus abbreviatus abbreviatus Miller

1899. *Microtus abbreviatus* Miller, Proc. Biol. Soc. Washington, 13:13, January 31, type from Hall Island, Bering Sea, Alaska. Known only from type locality.

Microtus abbreviatus fisheri Merriam

1900. *Microtus abbreviatus fisheri* Merriam, Proc. Washington Acad. Sci., 2:23, March 14, type from St. Matthew Island, Bering Sea, Alaska. Known only from type locality.

Subgenus **Orthriomys** Merriam

1898. *Orthriomys* Merriam, Proc. Biol. Soc. Washington, 12:106, April 30. Type, *Microtus umbrosus* Merriam.

Plantar tubercles, 5 (a rudiment of 6th); side glands rudimentary or absent; mammae 2–0 = 4; ears large and almost naked; feet large; tail long, approximately half as long as head and body, and scantily haired. Skull long and narrow; bullae small; M3 with 2 closed, rounded triangles and 1 open triangle; m2 with anterior pair of triangles confluent; m3 with posterior loop, 2 closed triangles, and anterior loop.

Microtus umbrosus Merriam
Zempoaltepec Vole

1898. *Microtus umbrosus* Merriam, Proc. Biol. Soc. Washington, 12:107, April 30, type from Mt. Zempoaltepec, 8200 ft., Oaxaca. Known only from type locality.

Average external measurements of 7 specimens: 184; 65; 23. Upper parts uniform dusky, with brown-tipped hairs; underparts dark plumbeous thinly washed with fulvous.

Subgenus **Herpetomys** Merriam

1898. *Herpetomys* Merriam, Proc. Biol. Soc. Washington, 12:107, April 30. Type, *Microtus guatemalensis* Merriam.

Plantar tubercles, 5; side glands on flanks of males small and obscure or absent; mammae 2–1 = 6, inguinal pair functionless; ears large; pelage long and soft; tail approximately one-third as long as head and body; auditory bullae not reduced; M3 with 3 closed triangles; m1 with 3 closed triangles and an interior confluent pair of triangles opening into terminal loop; m3 with 4 closed sections including a pair of subequal median triangles.

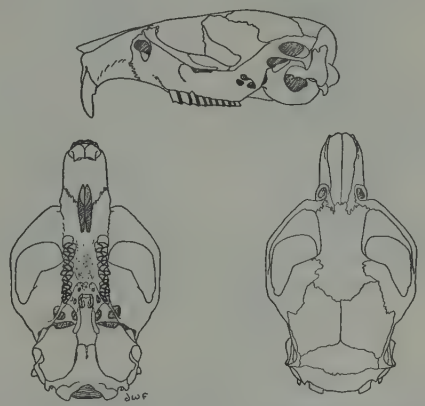
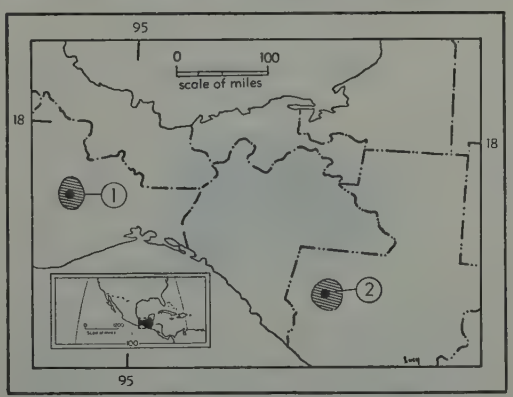


Fig. 411. *Microtus umbrosus*, Mt. Zempoaltepec, 8200 ft., Oaxaca, No. 68474 U.S.N.M., ♀, X 1½.

Microtus guatemalensis Merriam
Guatemalan Vole

1898. *Microtus guatemalensis* Merriam, Proc. Biol. Soc. Washington, 12:108, April 30, type from Todos Santos, 10,000 ft., Huehuetenango, Guatemala. Known only from type locality.

Average external measurements of 20 specimens: 150; 37; 21. Upper parts dark umber brown; nose blackish; lips white; underparts clear plumbeous or lightly washed with dull ochraceous.



Map 417. Two species of *Microtus*.
1. *M. umbrosus* 2. *M. guatemalensis*

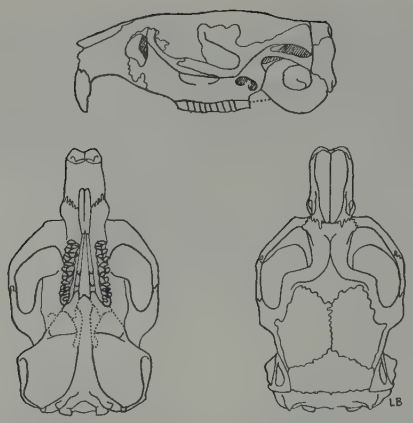


Fig. 412. *Microtus guatemalensis*, Todos Santos, Huehuetenango, Guatemala, No. 76767 U.S.N.M., ♂, X 1½.

Subgenus Pedomys Baird

Reviewed by Bole and Moulthrop, Sci. Publ. Cleveland Mus. Nat. Hist., 5:155–161, September 11, 1942.

1858. *Pedomys* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):517, July 14. Type, *Arvicola austerus* Le Conte [= *Hypudaeus ochrogaster* Wagner].

Plantar tubercles, 5; side glands obscure or wanting, rarely discernible; mammae 2–1 = 6; ears medium; fur long and coarse. Molars with wide reentrant angles; M3 with 2 closed triangles; m1 with 3 closed and 2 open triangles; m2 with anterior pair of triangles confluent; m3 with 3 transverse loops, middle loop sometimes constricted, or even divided into 2 triangles.

Microtus ochrogaster
Prairie Vole

External measurements: 130–172; 24–41; 17–22; 11–15. Weight, in grams, 37.0–48.0. Pelage long, lax, and coarse; upper parts light gray to dark bister, with peppery appearance resulting from mixture of black and whitish, pale fulvous or hazel-tipped hairs; sides paler; venter neutral gray or washed with whitish or pale cinnamon; tail sharply bicolor, dusky to dark bister above, whitish to buffy below. Embryos in 58 females from eastern Kansas ranged from 1 to 7 and averaged 3.4.

Microtus ochrogaster haydenii (Baird)

1858. *Arvicola* (*Pedomys*) *haydenii* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):543, July 14, type from Fort Pierre, Stanley Co., South Dakota.
1907. *Microtus ochrogaster haydeni*, Osgood, Proc. Biol. Soc. Washington, 20:48, April 18.

MARGINAL RECORDS (Hall and Cockrum, 1953:446–447).—Montana: 3 mi. E, 5 mi. S Culbertson, 1860 ft. North Dakota: Cannon Ball. South Dakota: 1 mi. W Oacoma. Nebraska: Callaway. Kansas: 3 mi. N, 2 mi. W Hoisington. Oklahoma: Garnett; Fort Reno; Alva. Kansas: Cairo; Scott County State Park. Colorado: Cañon City; Rist Cañon. Wyoming: 29 mi. N, 8¾ mi. E Laramie, 6420 ft.; Alcova, 5180 ft.; 12 mi. N, 3 mi. W Shoshone; 1 mi. S Greybull. Montana: Custer Station.

Microtus ochrogaster minor (Merriam)

1888. *Arvicola austerus minor* Merriam, Amer. Nat., 22: 600, July, type from Bottineau, at base of Turtle Mts., Bottineau Co., North Dakota.
1942. *Microtus ochrogaster minor*, Bole and Moulthrop, Sci. Publs. Cleveland Mus. Nat. Hist., 5:160, September 11.

MARGINAL RECORDS (Hall and Cockrum, 1953:447, unless otherwise noted).—Alberta: SE of Astotin Lake (Soper, 1951:20). Saskatchewan: Wingard. Manitoba: Riding Mtn. National Park (Soper, 1953:28); Winnipeg; Ridgeville. Minnesota: Elk River; Fort Snelling; Nicollet County; Ortonville. North Dakota: Oakes; Goodall. Sas-

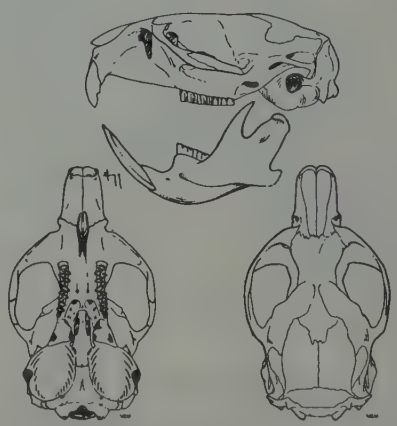


Fig. 413. *Microtus ochrogaster ochrogaster*, Lawrence, Douglas Co., Kansas, No. 1075 K.U., ♀, X 1½.

katchewan: Big Muddy Lake. Alberta: "A short distance east of Red River"; Edmonton.

Microtus ochrogaster ochrogaster (Wagner)

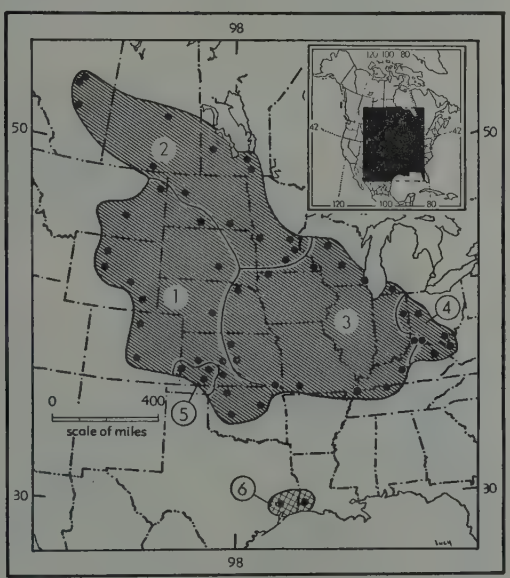
1842. *Hypudaeus ochrogaster* Wagner, *in* Schreber, Die Säugthiere . . . , Suppl., 3:592, type from America, probably from New Harmony, Indiana (see Bole and Moulthrop, Sci. Publs. Cleveland Mus. Nat. Hist., 5:157, September 11, 1942).

1898. *Microtus (Pedomys) ochrogaster*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:459, November 10.

1853. *Arvicola austerus* Le Conte, Proc. Acad. Nat. Sci. Philadelphia, 6:405, type from Racine, Wisconsin.

1858. *Arvicola (Pedomys) cinnamonea* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):541, July 14, type supposed by Baird to have come from Pembina, Minnesota [= Pembina, North Dakota?], but see V. Bailey (N. Amer. Fauna, 17:74, June 6, 1900) who thinks that the type came from somewhere within the geographic range of *M. o. ochrogaster*.

MARGINAL RECORDS (Hall and Cockrum, 1953:447).—Wisconsin: western part Clark County; Westpoint Township, Columbia Co.; Racine. Michigan: Cass County. Ohio: Union Township, Clermont Co. Kentucky: "vicinity of Canmer." Tennessee: Clarksville; Reelfoot, 3 mi. N Tiptonville. Missouri: Crane. Kansas: 18 mi. SW Columbus; *Cherryvale*; Smoky Hill River, 1 mi. S, ¾ mi. W Lindsborg; 3½ mi. W, ¾ mi. S Beloit. Nebraska: 8 mi. SW Niobrara. Iowa: Melvin. Minnesota: Winona County.



Map 418. *Microtus ochrogaster* and *Microtus ludovicianus*.

1. *M. ochrogaster haydeni*
2. *M. ochrogaster minor*
3. *M. ochrogaster ochrogaster*
4. *M. ochrogaster ohionensis*
5. *M. ochrogaster taylori*
6. *M. ludovicianus*

Microtus ochrogaster ohionensis Bole and Moulthrop

1942. *Microtus ochrogaster ohionensis* Bole and Moulthrop, Sci. Publs. Cleveland Mus. Nat. Hist., 5:155, September 11, type from Symmes Creek, 2 mi. N Chesapeake, Lawrence Co., Ohio.

MARGINAL RECORDS (Hall and Cockrum, 1953:448, unless otherwise noted).—Indiana: Salamonia. Ohio: Shelby County; type locality. West Virginia: Spring Valley Golf Course, near Huntington. Kentucky: Rowan County (Barbour, 1952:398). Ohio: Ripley.

Microtus ochrogaster taylori Hibbard and Rinker

1943. *Microtus ochrogaster taylori* Hibbard and Rinker, Univ. Kansas Sci. Bull., 29(pt. 2, no. 4): 256, October 15, type from farm of H. H. Hildebrand, ½ mi. N Fowler, Meade Co., Kansas.

MARGINAL RECORDS (Hall and Cockrum, 1953:448).—Kansas: Coolidge; ½ mi. NW Bellfont; type locality.

Microtus ludovicianus V. Bailey
Louisiana Vole

1900. *Microtus ludovicianus* V. Bailey, N. Amer. Fauna, 17:74, June 6, type from Iowa, Calcasieu Parish, Louisiana.

External measurements: 146–164; 33–36; 18.5–19. Upper parts dark gray, with a mixture of black-, brown-, and whitish-tipped hairs resulting in a peppery appearance; venter dark fulvous to dark buffy; tail indistinctly bicolor, dusky above, buffy below. This nominal species is closely related to *M. ochrogaster*.

MARGINAL RECORDS (Hall and Cockrum, 1953:448).—Louisiana: type locality. Texas: Sour Lake.

Subgenus Pitymys McMurtrie

1831. *Pitymys* McMurtrie, The animal kingdom . . . by the Baron Cuvier . . . , Amer. ed., 1:434. Type, *Psammomys pinetorum* Le Conte.

Skull weak, with relatively small squamosal crests, and supraorbital ridges widely separated in interorbital region of adults; tympanic bullae small; molars narrow; M3 with 2 closed triangles; m1 with 3 closed and 2 open triangles; m2 with anterior pair of triangles confluent; m3 with 3 transverse loops; plantar pads 5. External form modified for semifossorial life; fur soft and dense; ear reduced. Sole not fully haired; tail short; mammae 0–2 = 4. Cranially this subgenus closely resembles *Pedomys* but in areas where both subgenera occur can be distinguished by reddish (not grayish or blackish) upper parts, and molelike (not volelike) fur.

Microtus pinetorum
Pine Vole

External measurements: 105–145; 17–25; 16–20; 8–12. Weight, 25.2–38.8 grams. Upper parts bright russet brown to brownish chestnut, sometimes lined with blackish-tipped hairs on back and rump; venter plumbeous with wash of dull buff to bright cinnamon; tail indistinctly bicolor or even unicolor, usually same color as back. Nine females of *M. p. nemoralis* from Kansas and Arkansas had an average number of 2.9 (2–5) embryos.

For the use of *Microtus* instead of *Pitymys* we follow Hall and Cockrum, 1953:448–451, because of our inability to distinguish the skulls of some specimens of *Microtus ochrogaster* in eastern Kansas from those of *Microtus pinetorum* in the same area.

Microtus pinetorum auricularis V. Bailey

1898. *Microtus pinetorum auricularis* V. Bailey, Proc. Biol. Soc. Washington, 12:90, April 30, type from Washington, Adams Co., Mississippi.

MARGINAL RECORDS (Hall and Cockrum, 1955:449, unless otherwise noted).–Ohio: Union Township, Clermont Co. Kentucky: Monticello. Tennessee: LaFollette. North Carolina: Cherokee County. Alabama: Sand Mtn. near Carpenter. Mississippi: Jones County. Louisiana: Baton Rouge. Texas: 1 mi. E Nacogdoches (McCarley and Bradshaw, 1953:516, used the subspecific name *nemoralis*; Nos. 2660 and 2661 Univ. Texas identified by us as subspecies *auriculus*); 3 mi. S Kerrville; Jefferson. Illinois: Olive Branch; Reevesville. Indiana: Worthington.

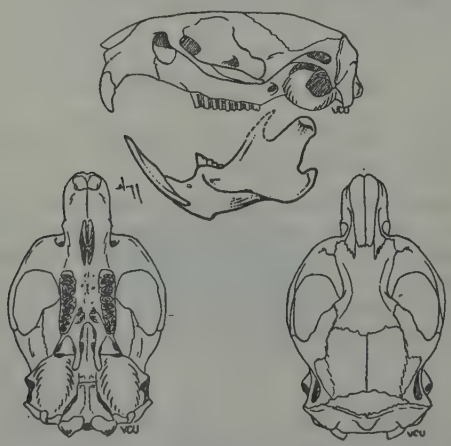


Fig. 414. *Microtus pinetorum nemoralis*, 8½ mi. SW Toronto, Greenwood Co., Kansas, No. 8038 K.U., ♀, X 1¾.

Microtus pinetorum carbonarius (Handley)

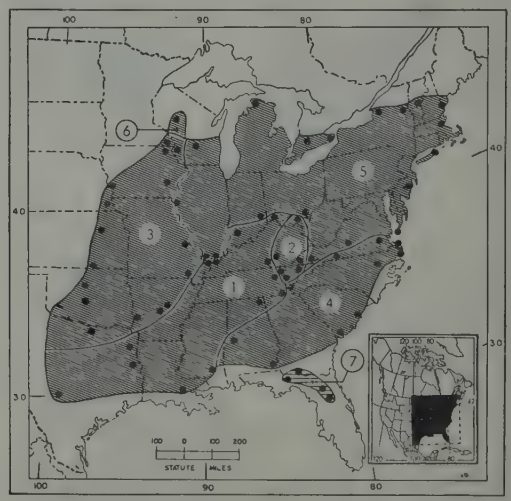
1952. *Pitymys pinetorum carbonarius* Handley, Jour. Washington Acad. Sci., 42:152, May 28, type from Eubank, Pulaski Co., Kentucky.
1953. *Microtus pinetorum carbonarius*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:449, January 15.

MARGINAL RECORDS (Hall and Cockrum, 1953:449).–Ohio: Symmes Creek. Virginia: Cleveland. Tennessee: Watauga Valley; Jefferson County; High Cliff. Kentucky: Quicksand.

Microtus pinetorum nemoralis V. Bailey

1898. *Microtus pinetorum nemoralis* V. Bailey, Proc. Biol. Soc. Washington, 12:89, April 30, type from Stilwell, Adair Co., Oklahoma.

MARGINAL RECORDS (Hall and Cockrum, 1953:449, unless otherwise noted).–Minnesota: Caledonia. Wisconsin: Lynxville. Iowa: Iowa City. Missouri: Kimmswick; Williamsville. Arkansas: Beebe; Fourche Bayou, near Little Rock; Cove. Texas: S of Woodbine (Russell, 1953:462). Oklahoma: Norman; Indiahoma; Logan County. Kansas: 3 mi. SE Arkansas City; Manhattan. Nebraska: London. Iowa: Council Bluffs; Decorah.



Map 419. *Microtus pinetorum* and *Microtus parvulus*.

Guide to kinds
1. *M. pinetorum auriculus*
2. *M. pinetorum carbonarius*
3. *M. pinetorum nemoralis*
4. *M. pinetorum pinetorum*
5. *M. pinetorum scalopsoides*
6. *M. pinetorum schmidti*
7. *M. parvulus*

Microtus pinetorum pinetorum (Le Conte)

1830. *Psammomys pinetorum* Le Conte, Ann. Lyc. Nat. Hist., New York, 3:133, type from pine forests of Georgia, probably on the Le Conte plantation, near Riceboro, Liberty Co.
1896. *Microtus pinetorum,* Miller, N. Amer. Fauna, 12:9, July 23.

MARGINAL RECORDS (Hall and Cockrum, 1953:450). —Virginia: Prince George County. North Carolina: Currituck; Tarboro. South Carolina: Georgetown; Beaufort. Alabama: Ashford; Greensboro. North Carolina: *Highlands*; Marshall. Virginia: Patrick County.

Microtus pinetorum scalopsoides (Aud. and Bachman)

1841. *Arvicola scalopsoides* Audubon and Bachman, Proc. Acad. Nat. Sci. Philadelphia, 1:97, October, type from Long Island, New York.
1896. *Microtus pinetorum scalopsoides,* Batchelder, Proc. Boston Soc. Nat. Hist., 27:187, October.
1853. *Arvicola apella* Le Conte, Proc. Acad. Nat. Sci. Philadelphia, 6:405, type from Pennsylvania.
1858. *Arvicola kennicottii* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):547, July 14, type from Illinois.

MARGINAL RECORDS (Hall and Cockrum, 1953:451). —Michigan: Emmet County. Ontario: near London; Point Abino. New York: Lewis County; Lake George. Vermont: Sherburne. New Hampshire: Durham. Massachusetts: Saugus, about 9 mi. N Boston. New York: Montauk Point, Long Island. New Jersey: Tuckerton. Virginia: Cape Charles; Wallaceton; Campbell County; Washington County. Ohio: Hocking. Indiana: Brookville. Illinois: Metropolis; Alto Pass; Warsaw. Wisconsin: near Prairie du Sac.

Microtus pinetorum schmidti (Jackson)

1941. *Pitymys pinetorum schmidti* Jackson, Proc. Biol. Soc. Washington, 54:201, December 8, type from Worden Township, Clark Co., Wisconsin. Known only from type locality.
1953. *Microtus pinetorum schmidti,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:451, January 15.

Microtus parvulus (A. H. Howell)
Florida Pine Vole

1916. *Pitymys parvulus* A. H. Howell, Proc. Biol. Soc. Washington, 29:83, April 4, type from "near the town of Lynne, Marion County, Florida" (see A. H. Howell, Jour. Mamm., 15:72, February 15, 1934).
1953. *Microtus parvulus,* Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:451, January 15.

External measurements: 107–113; 15–25; 13–15. "Upper parts tawny, shading on the sides and tail to vinaceous-cinnamon; underparts dusky, faintly shaded with vinaceous-cinnamon" (Hamilton, 1943: 338). This species is much paler and smaller than either *M. pinetorum* or *M. quasiater,* and nothing is known of its life history or reproductive habits.

MARGINAL RECORDS (Hall and Cockrum, 1953:451). —Georgia: 10 mi. SSW Thomasville. Florida: Gainesville; type locality; Quincy.

Microtus quasiater (Coues)
Jalapan Pine Vole

1874. *Arvicola* (*Pitymys*) *pinetorum* var. *quasiater* Coues, Proc. Acad. Nat. Sci. Philadelphia, 26:191, December 15, type from Jalapa, Veracruz.
1896. *M[icrotus]. quasiater,* Miller, N. Amer. Fauna, 12:60, July 23.

External measurements: 112–137; 17–25; 17–19; 11–18. Uniform dark umber or seal brown above, slightly paler on venter; tail slightly paler below than above. Average number of embryos for 11 females from 5 km. N Jalapa, 4500 ft., Veracruz, was 2.2 (1–4).

MARGINAL RECORDS (Hall and Cockrum, 1953:452, unless otherwise noted).—San Luis Potosí: Apetsco. Veracruz: 5 km. N Jalapa; Orizaba. Puebla: Huauchinango. Hidalgo: 16 km. NW Jacala, 1550 m. (Baker and Villa, 1953:149).

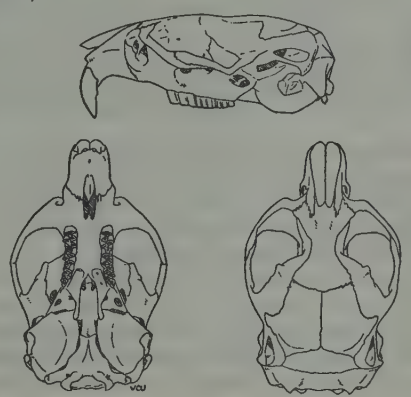
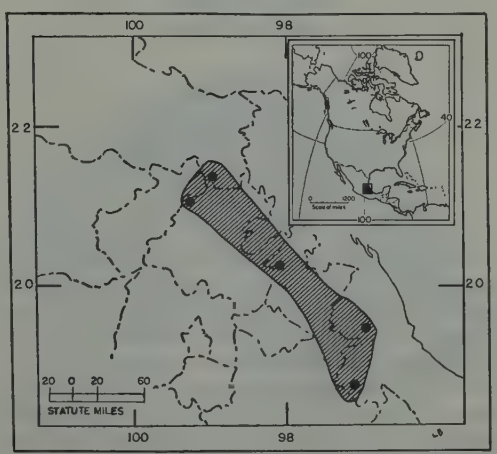


Fig. 415. *Microtus quasiater,* Teocelo, 4500 ft., Veracruz, No. 30706 K.U., ♀, X 1½.



Map 420. *Microtus quasiater.*

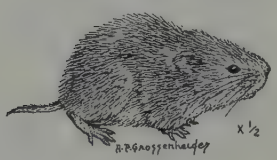
Genus Lagurus Gloger—Sagebrush Vole

1841. *Lagurus* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, 1:97. Type, *Lagurus nigratorius* Gloger [= *Mus lagurus* Pallas].
1881. *Eremiomys* Polyakoff, Mem. Acad. Imp. Sci. St. Pétersbourg, 39, supplement, p. 34. Type, *Mus lagurus* Pallas.
1912. *Lemmiscus* Thomas, Ann. Mag. Nat. Hist., ser. 8, 9:401, April. Type, *Arvicola curtata* Cope.

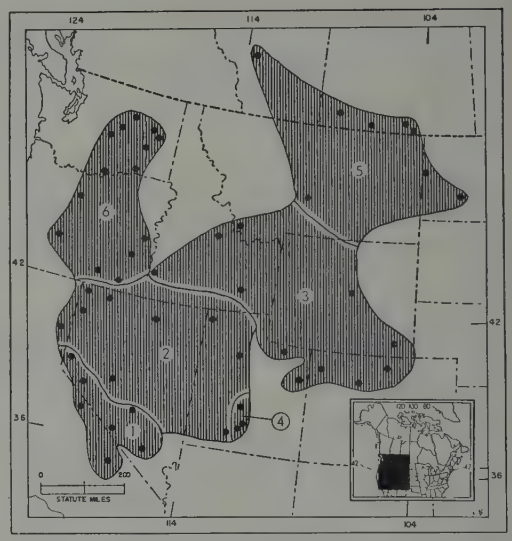
External measurements as given below for the species; basal length, 20.0–23.2; zygomatic breadth, 13.2–15.0. Body thickset and lemminglike; tail short, approximately the length of the hind foot; sole of hind foot densely haired, with 5 concealed pads; ears short and more or less covered with light gray fur; mammae 2–2 = 8; cheek-teeth evergrowing with widely open folds and lacking cement in the folds; skull angular, flattened and with prominent peglike squamosal crests; supraorbital ridges, although strong, not fused in interorbital region; auditory bullae large, projecting posteriorly beyond plane of occiput, cancellous and foamlike in structure.

The American species have been separated, under the subgeneric name *Lemmiscus* Thomas, from the Old World representatives, on the basis of the following characters: antitragus present (rather than absent); ear more than half as long as hind foot; cement present in re-entrant angles of molars; 4 (not 5) closed triangles in m3. On the basis of these features, some workers have considered the American species as sufficiently distinct to warrant generic separation, under the name *Lemmiscus*.

Lagurus curtatus
Sagebrush Vole



External measurements: 108–142; 16–28; 14–18; 9–13. Weight, in grams, 17.5–24.8. Pelage long and lax; upper parts pale buffy gray to ashy gray; ears and nose tinged with buff; sides paler; venter silvery or soiled whitish to buffy; tail indistinctly bicolor, with dusky line above but silvery white to buffy below. Embryos in 33 females from Wyoming, Nevada, and Washington ranged from 3 to 8 and averaged 6.1.



Map 421. *Lagurus curtatus.*

1. *L. c. curtatus*
2. *L. c. intermedius*
3. *L. c. levidensis*
4. *L. c. orbitus*
5. *L. c. pallidus*
6. *L. c. pauperrimus*

Lagurus curtatus curtatus (Cope)

1868. *Arvicola curtata* Cope, Proc. Acad. Nat. Sci. Philadelphia, 20:2, type from Pigeon Spring, Mt. Magruder, Nevada, near boundary between Inyo Co., California, and Esmeralda Co., Nevada.
1912. *Lagurus* (*Lemmiscus*) *curtatus*, Thomas, Ann. Mag. Nat. Hist., ser. 8, 9:401, April.
1877. *Arvicola decurtata* Coues, *in* Coues and Allen, Monogr. N. Amer. Rodentia, p. 215 (in text), August, a *nomen nudum.*

MARGINAL RECORDS (Hall and Cockrum, 1953:453).—Nevada: 11 mi. SE Reno; Breen Creek, Kawich Mts.; S end Belted Range, 5½ mi. NW Whiterock Spring; Mt. Magruder, Indian Spring. California: Inyo Mts.; White Mts.; Mono Mills. Nevada: Lapon Canyon, Mt. Grant.

Fig. 416. *Lagurus curatus curatus*, Chiatovich Creek, 8200 ft., Esmeralda Co., Nevada, No. 38731 M.V.Z., ♂, X 1½.

Lagurus curtatus intermedius (Taylor)

1911. *Microtus* (*Lagurus*) *intermedius* Taylor, Univ. California Publ. Zool., 7:253, June 24, type from head of Big Creek, 8000 ft., Pine Forest Mts., Humboldt Co., Nevada.
1934. *Lagurus curtatus intermedius*, Borell and Ellis, Jour. Mamm., 15:35, February 15.

MARGINAL RECORDS (Hall and Cockrum, 1953:453). —Nevada: 4 mi. S Diessner; 5 mi. N Summit Lake; 1 mi. SE Tuscarora, 5900 ft. Utah: Grouse Creek, Raft River Mts., 6500 ft.; Butterfield Canyon, 3 mi. SW Butterfield Tunnel, 7000 ft.; Daves Hollow, Bryce Canyon National Park. Nevada: Dutch Flat Schoolhouse, Reese River. California: Madeline Plains, 6 mi. E Ravendale. Nevada: 15 mi. S Vya.

Lagurus curtatus levidensis (Goldman)

1941. *Lemmiscus curtatus levidensis* Goldman, Proc. Biol. Soc. Washington, 54:70, July 31, type from 5 mi. E Canadian River, west base Medicine Bow Range, 8000 ft., east of Walden, North Park, Jackson Co., Colorado.
1951. *Lagurus curtatus levidensis*, Kelson, Jour. Mamm., 32:114, February 15.

MARGINAL RECORDS (Hall and Cockrum, 1953:454). —Montana: Donovan. Wyoming: 16 mi. S, 11 mi. W Waltman, 6950 ft.; 5 mi. N Horse Creek P.O. Colorado: Fort Collins; Toponas; 8 mi. S Lily. Utah: Browns Corral, 20 mi. S Ouray, 6250 ft.; Blacks Fork, 10,000 ft., Uinta Mts. Idaho: American Falls; 45 mi. SE Silver City; Salmon River Mts.

Lagurus curtatus orbitus Dearden and Lee

1955. *Lagurus curtatus orbitus* Dearden and Lee, Jour. Mamm., 36:271, May 26, type from Steep Creek, 15 mi. N of Boulder, 8500 ft., Garfield Co., Utah.

MARGINAL RECORDS (Dearden and Lee, 1955:273). —Utah: W of Skougaard's Resort, Fishlake, 9000 ft.; Spectacle Lake, 10,500 ft., 13 mi. S Teasdale; *type locality*; Cowpuncher R.S., 18 mi. N Escalante, 9500 ft.

Lagurus curtatus pallidus (Merriam)

1888. *Arvicola* (*Chilotus*) *pallidus* Merriam, Amer. Nat., 22:704, August, type from Fort Buford, Williams Co., North Dakota.
1953. *Lagurus curtatus pallidus*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:455, January 15.

MARGINAL RECORDS (Hall and Cockrum, 1953:455). —Alberta: Calgary. Saskatchewan: Eastend; 6 mi. NW Val Marie; Big Muddy Coulee, 10 mi. SE Willowbunch Lake; Big Muddy Lake. North Dakota: type locality; Glen Ullin. Montana: Philbrook.

Lagurus curtatus pauperrimus (Cooper)

1868. *Arvicola pauperrima* Cooper, Amer. Nat., 2:535, December, type from plains of the Columbia, near the Snake River, southwestern Washington.
1946. [*Lagurus curtatus*] *pauperrimus*, Hall, Mammals of Nevada, p. 560, July 1.

1913. *Microtus* (*Lagurus*) *curtatus artemisiae* Anthony, Bull. Amer. Mus. Nat. Hist., 32:14, March 7, type from Ironside, 4000 ft., Malheur Co., Oregon (V. Bailey, N. Amer. Fauna, 55:214, August 29, 1936, regards *artemisiae* as inseparable from *L. c. pauperrimus*).

MARGINAL RECORDS (Hall and Cockrum, 1953:455). —Washington: 3 mi. W Delrio; 11 mi. E Creston; 5 mi. N Edwall; 2 mi. SW Ritzville; Great Plain of Columbia near Snake River. Oregon: Ironside; Creston; Steens Mts.; Rock Creek, N side Hart Mtn.; Fort Rock; Antelope. Washington: 10 mi. SE Bickleton; 8 mi. N Kittitas; 8 mi. SW Waterville. (Not found: 2 mi. E Vomer.)

Genus Neofiber True—Round-tailed Muskrat

Revised by Schwartz, Occas. Papers Mus. Zool., Univ. Michigan, 547:1-27, 3 pls., July 29, 1953.

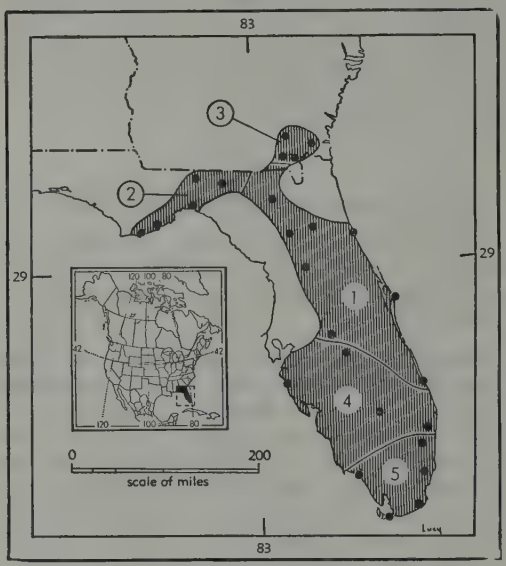
1884. *Neofiber* True, Science, 4:34, July 11. Type, *Neofiber alleni* True.

External measurements: 285–381; 99–168; 40–50; 15–22. Weight, 155–330 grams; condylobasal length, 41.5–50.1; zygomatic breadth, 25.3–30.4. Externally modified for aquatic life, but less so than *Ondatra*; tail round, with long hairs partly covering it; hind foot larger than forefoot; swimming-fringes on feet and tail not highly developed. Mammae 1–2 = 6. Upper parts sorghum brown to blackish brown; venter grayish-white with buffy to avellaneous wash. Skull much as in *Ondatra* but smaller; m1 with 5 [not 6] triangles between anterior loop and posterior loop; anterior loop rounded and with shallow re-entrant angles; m3 reduced, has only 1 outer fold [not 2] and 2 [instead of 3] salient angles.

Neofiber alleni
Round-tailed Muskrat

As described for the genus. Embryos or young less than one month of age have been recorded in

the months of January, February, March, April, June, and August. The number of embryos recorded is one and two. Although *Neofiber* swims it is more a bog animal than an aquatic animal.



Map 422. *Neofiber alleni.*

Guide to subspecies
1. *N. a. alleni*
2. *N. a. apalachicolae*
3. *N. a. exoristus*
4. *N. a. nigrescens*
5. *N. a. struix*

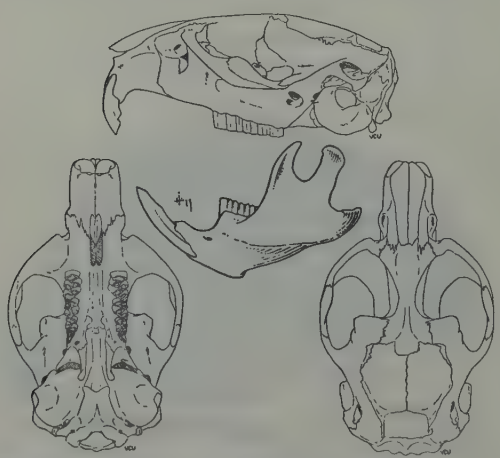


Fig. 417. *Neofiber alleni alleni,* 1 mi. E Courtenay, Merritt Island, Brevard Co., Florida, No. 27124 K.U., ♀, X 1.

Neofiber alleni alleni True

1884. *Neofiber alleni* True, Science, 4:34, July 11, type from Georgiana, Brevard Co., Florida.

MARGINAL RECORDS (Schwartz, 1953:11–12, unless otherwise noted).—Florida: Lake City (*op. cit.*:7); ¾ mi. E Grandin; 1¾ mi. W Flagler Beach; Canaveral; 1 mi. NE Stuart (*op. cit.*:19, recorded as an intergrade between *N. a. alleni* and *N. a. nigrescens*); Winterhaven (*ibid.*); *Sumter County* (*ibid.*); Belleview; 3½ mi. S Gainesville.

Neofiber alleni apalachicolae Schwartz

1953. *Neofiber alleni apalachicolae* Schwartz, Occas. Papers Mus. Zool., Univ. Michigan, 547:14, July 29, type from Apalachicola, east side of river, Franklin Co., Florida.

MARGINAL RECORDS (Schwartz, 1953:15–16).—Florida: Lake Miccosukee; 2 mi. W Madison; St. Marks River, Wakulla Co.; Carabelle; type locality.

Neofiber alleni exoristus Schwartz

1953. *Neofiber alleni exoristus* Schwartz, Occas. Papers Mus. Zool., Univ. Michigan, 547:12, July 29, type from 12⅑ mi. SE Waycross, Ware Co., Georgia.

MARGINAL RECORDS (Schwartz, 1953:14, unless otherwise noted).—Georgia: type locality; Woodbine (*op. cit.*:12); ¾ mi. W Chessers Island, Okefinokee Swamp; Billy's Island, Okefinokee Swamp.

Neofiber alleni nigrescens Howell

1920. *Neofiber alleni nigrescens* Howell, Jour. Mamm., 1:79, March 2, type from Ritta, south shore of Lake Okeechobee, Palm Beach Co., Florida.

MARGINAL RECORDS (Schwartz, 1953:19).—Florida: 2¾ mi. E Frostproof; 14 mi. NW Delray Beach, Loxahatchee Wildlife Refuge; 4 mi. W Clewston; S of Sarasota.

Neofiber alleni struix Schwartz

1952. *Neofiber alleni struix* Schwartz, Chicago Acad. Sci., Nat. Hist. Miscl., 101:1, February 15, type from 21 mi. W Miami, Dade Co., Florida.

MARGINAL RECORDS (Schwartz, 1953:21–22, unless otherwise noted).—Florida: about 22 mi. NW Fort Lauderdale; 2 mi. NW Miami Springs; 7⅛ mi. SE Florida City; Cape Sable; Everglades (*op. cit.*:19, recorded as an intergrade between *N. a. struix* and *N. a. nigrescens*).

Genus **Ondatra** Link—Muskrats

Revised (under name *Fiber*) by N. Hollister, N. Amer. Fauna, 32:1–47, 6 pls., April 29, 1911.

1795. *Ondatra* Link, Beyträge zur Naturgeschichte, 1(2): 76. Type by tautonymy, *Castor zibethicus* Linnaeus (International Commission on Zoological Nomenclature, Opinion 55, Smiths. Inst. Spec. Publ., 2169:126–127, May 12, 1913).

1800. *Fiber* Cuvier, Leçons d'anatomie comparée . . . , 1:tabl. 1. Type, *Castor zibethicus* Linnaeus.
1817. *Simotes* Fischer, Mem. Soc. Imp. Nat. Moscow, 5:444. Type, *Mus zibethicus* [= *Castor zibethicus* Linnaeus].
1827. *Moschomys* Billberg, Synopsis fauna Scandinaviae, ed. 1:1, Mamm., Conspectus A (before p. 1). Type, *Castor zibethicus* Linnaeus.

External measurements: 409–620; 180–295; 64–88. Weight, 541–1575 grams; basal length of skull, 52.4–65.1; zygomatic breadth, 34.6–44.0. Externally highly modified for aquatic life; tail laterally compressed, relatively long, and more or less naked but with well-developed swimming-fringe below; hind foot much larger than forefoot, with conspicuous swimming-fringes; ears short; fur thick and soft. Mammae 1–2 = 6. Upper parts vary from a bright rusty red through several shades of brown to almost black; sides from bright rusty red to Prout's Brown; venter from whitish to Broccoli Brown with washes of varying intensities of rufous, cinnamon and brownish; feet pinkish gray to dark brown.

Skull resembling those of *Microtus* and *Neofiber* but larger and more massive. Differs from *Neofiber* in structure of lower molars (m1 with 6 [not 5] triangles between anterior loop and posterior loop; first 1 of 6 triangles not closed; anterior loop bilobed and with deep re-entrant angles; m3 with 3 [not 2] outer salient angles).

KEY TO NOMINAL SPECIES OF ONDATRA

1. Upper parts averaging lighter than dark mummy brown; basal length of skull averaging more than 54 mm.; not in Newfoundland. . . . . *O. zibethicus*, p. 755
1'. Upper parts dark mummy brown to black; basal length of skull averaging less than 54 mm.; native to Newfoundland only. *O. obscurus*, p. 755

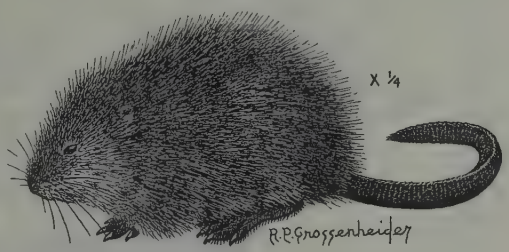
Ondatra obscurus (Bangs)
Newfoundland Muskrat

1894. *Fiber obscurus* Bangs, Proc. Biol. Soc. Washington, 9:133, September 15, type from Codroy, Newfoundland.
1912. *Ondatra obscura*, Miller, Bull. U. S. Nat. Mus., 79: 230, December 31.

Average external measurements of 7 adults: 500; 226; 76. Basal length of skull, 53.2; zygomatic breadth, 34.7. This insular species differs from *O. zibethicus* in smaller, "weaker" skull, larger parietals and larger (in relation to size of the animal) hind foot.

MARGINAL RECORDS (Hall and Cockrum, 1953:470).—Newfoundland: Bay St. George; type locality.

Ondatra zibethicus
Muskrat



Measurements and description are as given in the account of the genus. The muskrat breeds at any time of the year in the southern part of its range; farther northward the breeding season is from April to August. Two litters per year are usually obtained from pen-raised animals. The litter-size varies from 1 to 11 and averages 6.5.

The muskrat has been introduced into many areas where it did not occur naturally. Some of these introductions have been deliberate; others have been accidental—escapes from fur farms. Storer (1937: 443–460) has listed several known introductions in California and on several islands off the coast of British Columbia. Newsom (1937:437) reported that muskrats have been introduced on Anticosti Island in the Gulf of St. Lawrence. So far as we know, this is the only American microtine that has become established in Eurasia; the muskrat now occurs at many places in Europe and in northern Asia.

In North America, trappers receive more dollars for muskrat pelts than they do for the pelts of any other one kind of furbearer.

Ondatra zibethicus albus (Sabine)

1823. *Fiber zibethicus—albus* Sabine, *in* Franklin, Narrative of a journey to the shores of the Polar Sea in . . . 1819–22, p. 660, type from Cumberland House, Saskatchewan.
1912. *Ondatra zibethica alba*, Miller, Bull. U. S. Nat. Mus., 79:231, December 31.
1902. *Fiber zibethicus hudsonius* Preble, N. Amer. Fauna, 22:53, October 31, type from Fort Churchill, Keewatin.

MARGINAL RECORDS (Hall and Cockrum, 1953:465, unless otherwise noted).—Manitoba: Fort Churchill; York Factory; Echimamish River; Whitewater Lake, Riding Mtn. National Park (Soper, 1953:28). Saskatchewan: Prince Albert National Park (Soper, 1952:38).

Ondatra zibethicus aquilonius (Bangs)

1899. *Fiber zibethicus aquilonius* Bangs, Proc. New England Zool. Club, 1:11, February 28, type from Rigolet, Hamilton Inlet, Labrador.

Map 423. *Ondatra obscurus* and *Ondatra zibethicus.*

1. *O. obscurus*
2. *O. z. albus*
3. *O. z. aquilonius*
4. *O. z. bernardi*
5. *O. z. cinnamominus*
6. *O. z. goldmani*
7. *O. z. macrodon*
8. *O. z. mergens*
9. *O. z. occipitalis*
10. *O. z. osoyoosensis*
11. *O. z. pallidus*
12. *O. z. ripensis*
13. *O. z. rivalicus*
14. *O. z. spatulatus*
15. *O. z. zalophus*
16. *O. z. zibethicus*

1912. *Ondatra zibethica aquilonia,* Miller, U. S. Nat. Mus., 79:230, December 31.

MARGINAL RECORDS (Hall and Cockrum, 1953:466).—Quebec: [Ungava] Forks; thence around coast to: Kecarpoui.

Ondatra zibethicus bernardi Goldman

1932. *Ondatra zibethica bernardi* Goldman, Proc. Biol. Soc. Washington, 45:93, June 21, type from 4 mi. S Gadsden, Yuma Co., Arizona.

MARGINAL RECORDS (Hall and Cockrum, 1953:466).—Nevada: Colorado River, Durban Ranch, 14 mi. E Searchlight. Arizona: Topock; type locality. Baja California: 15 mi. S Volcano Lake. California: Calipatria.

Ondatra zibethicus cinnamominus (Hollister)

1910. *Fiber zibethicus cinnamominus* Hollister, Proc. Biol. Soc. Washington, 23:125, September 2, type from Wakeeney, Trego Co., Kansas.

1912. *Ondatra zibethica cinnamomina,* Miller, Bull. U. S. Nat. Mus., 79:232, December 31.

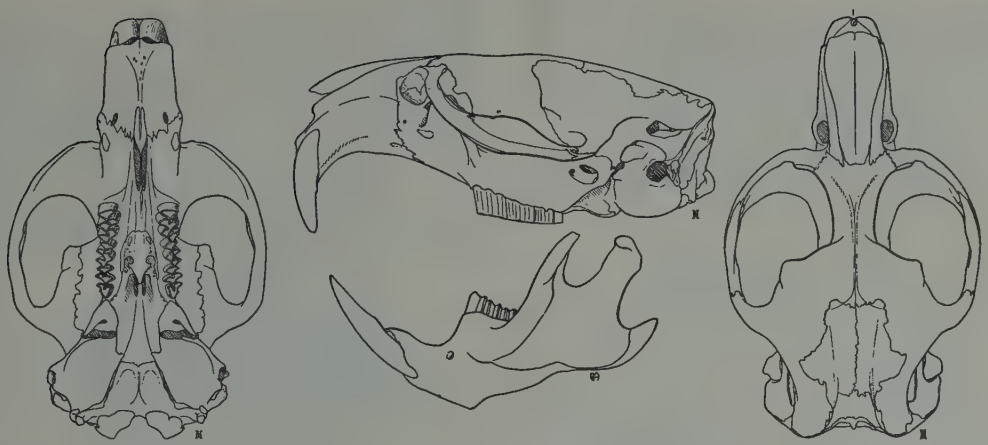


Fig. 418. *Ondatra zibethicus mergens*, 10 mi. SE Fallon, Nevada, No. 90544 M.V.Z., ♂, X 1.

MARGINAL RECORDS (Hall and Cockrum, 1953:467, unless otherwise noted).—Manitoba: Carberry. North Dakota: Oakes. Iowa: Cedar Falls (Polder, 1953:724); Knoxville. Kansas: 6 mi. SW Garnett; Halstead. Oklahoma: 2 mi. N Dawson; Norman. Texas: Canadian. Colorado: Ward. Wyoming: Sun. Montana: Little Dry Creek. Alberta: Lodge Creek.

Ondatra zibethicus goldmani Huey

1938. *Ondatra zibethica goldmani* Huey, Trans. San Diego Soc. Nat. Hist., 8:409, January 18, type from Saint George, Washington Co., Utah.

MARGINAL RECORDS (Hall and Cockrum, 1953:467).—Utah: Orderville. Nevada: Muddy Creek near St. Thomas.

Ondatra zibethicus macrodon (Merriam)

1897. *Fiber macrodon* Merriam, Proc. Biol. Soc. Washington, 11:143, May 13, type from Lake Drummond, Dismal Swamp, Norfolk Co., Virginia.
1912. *Ondatra zibethica macrodon*, Miller, Bull. U. S. Nat. Mus., 79:230, December 31.
1911. *F[iber]. niger* Brass, Aus dem Reiche der Pelze, p. 604, type locality in New Jersey or Delaware.

MARGINAL RECORDS (Hall and Cockrum, 1953:467).—Pennsylvania: Chester County, thence east to coast and down coast into North Carolina: Raleigh. Virginia: Nelson County; Washington. *Maryland: Jefferson.*

Ondatra zibethicus mergens (Hollister)

1910. *Fiber zibethicus mergens* Hollister, Proc. Biol. Soc. Washington, 23:1, February 2, type from Fallon, Churchill Co., Nevada.
1912. *Ondatra zibethica mergens*, Miller, Bull. U. S. Nat. Mus., 79:231, December 31.

MARGINAL RECORDS (Hall and Cockrum, 1953:467).—Nevada: Paradise; Marys River, 22 mi. N Deeth, 5000 ft.; W side Ruby Lake, 3 mi. N White Pine Co. line, 6200 ft.; 20 mi. S Schurz, W side Walker Lake; Carson River, 5 mi. SE Minden, 4900 ft. California: *Lake Tahoe*; Eagle Lake.

Ondatra zibethicus occipitalis (Elliot)

1903. *Fiber occipitalis* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3:162, May 2, type from Florence, Lane Co., Oregon.
1912. *Ondatra zibethica occipitalis*, Miller, Bull. U.S. Nat. Mus., 79:231, December 31.

MARGINAL RECORDS (Hall and Cockrum, 1953:467).—Washington: Aberdeen. Oregon: Portland; Coquille.

Ondatra zibethicus osoyoosensis (Lord)

1863. *Fiber osoyoosensis* Lord, Proc. Zool. Soc. London, p. 97, October, type from Lake Osoyoos, British Columbia.
1912. *Ondatra zibethica osoyoosensis*, Miller, Bull. U. S. Nat. Mus., 79:231, December 31.

MARGINAL RECORDS (Hall and Cockrum, 1953:467-468, unless otherwise noted).—British Columbia (Cowan and Guiguet, 1956:230): Williams Lake; Golden. Alberta: Stoney and Crooked Highwood Mts. Wyoming: Valley. Colorado: Hot Sulphur Springs. New Mexico: 3 mi. SE Cimarron; Albuquerque. Utah: Utah Lake; Ogden. Nevada: Goose Creek, 2 mi. W Utah boundary, 5000 ft. Idaho: S fork Owyhee River, 12 mi. N Nevada line. Oregon: Shirk, W of Steens Mts.; The Dalles. Washington: Tenino. British Columbia: Port Moody; Ashcroft.

Ondatra zibethicus pallidus (Mearns)

1890. *Fiber zibethicus pallidus* Mearns, Bull. Amer. Mus. Nat. Hist., 2:280, February 21, type from Fort Verde, Yavapai Co., Arizona.
1912. *Ondatra zibethica pallida*, Miller, Bull. U.S. Nat. Mus., 79:232, December 31.

MARGINAL RECORDS (Hall and Cockrum, 1953:468).—Arizona: type locality. New Mexico: Upper Tularosa River. Arizona: Camp Grant.

Ondatra zibethicus ripensis (V. Bailey)

1902. *Fiber zibethicus ripensis* V. Bailey, Proc. Biol. Soc. Washington, 15:119, June 2, type from Eddy, near Carlsbad, Eddy Co., New Mexico.
1912. *Ondatra zibethica ripensis*, Miller, Bull. U. S. Nat. Mus., 79:232, December 31.

MARGINAL RECORDS (Hall and Cockrum, 1953:469).—New Mexico: Santa Rosa. Texas: Fort Stockton. New Mexico: Carlsbad.

Ondatra zibethicus rivalicius (Bangs)

1895. *Fiber zibethicus rivalicius* Bangs, Proc. Boston Soc. Nat. Hist., 26:541, July 31, type from Burbridge, Plaquemines Parish, Louisiana.
1940. *Ondatra z[ibethicus]. rivalicius*, Davis and Lowery, Jour. Mamm., 21:212, May 16.

MARGINAL RECORDS (Hall and Cockrum, 1953:469).—Alabama: Three-mile Creek, near Mobile. Texas: 2 mi. SW Pasadena. Louisiana: Pointe Coupee Parish.

Ondatra zibethicus spatulatus (Osgood)

1900. *Fiber spatulatus* Osgood, N. Amer. Fauna, 19:36, October 6, type from Lake Marsh, Yukon.
1912. *Ondatra zibethica spatulata*, Miller, Bull. U.S. Nat. Mus., 79:231, December 31.

MARGINAL RECORDS (Hall and Cockrum, 1953:469, unless otherwise noted).—Mackenzie: Richards Island; Fort Anderson; Fort Reliance. Alberta: Athabaska Lake; Blindman River; Henry House. British Columbia (Cowan and Guiguet, 1956:231): Chezacut Lake; Wistaria. Alaska: Portage Cove, Revillagigedo Island; Sergief Island. British Columbia: Bennett. Alaska: Anklin River, Yakutat Bay; Eagle; Ladd (Strecker, *et al.*, 1952:479); Russian Mission, Yukon River; Nome; Lava Lake (Quay, 1951:98); Kobuk Valley; Fort Hamlin.

Ondatra zibethicus zalophus (Hollister)

1910. *Fiber zibethicus zalophus* Hollister, Proc. Biol. Soc. Washington, 23:1, February 2, type from Becharof Lake, Alaska Peninsula, Alaska.
1912. *Ondatra zibethica zalophus*, Miller, Bull. U. S. Nat. Mus., 79:231, December 31.

MARGINAL RECORDS (Hall and Cockrum, 1953:469).—Alaska: Knik Valley; Fort Kenai; Ugashik; Nushagak.

Ondatra zibethicus zibethicus (Linnaeus)

1766. [*Castor*] *zibethicus* Linnaeus, Syst. nat., ed. 12, 1:79, type from eastern Canada.
1795. [*Ondatra*] *zibethicus* Link, Beyträge zur Naturgeschichte, 1(2):76.
1808. *Ondatra americana* Tiedemann, Zoologie . . . , 1: 481, a renaming of *Mus zibethicus* Schreber and *Castor zibethicus* Linnaeus.
1829. *Fiber zibethicus*, var. B, *nigra* Richardson, Fauna Boreali-Americana, 1:119 (no definite locality).
1829. *Fiber zibethicus*, var. C, *maculosa* Richardson, Fauna Boreali-Americana, 1:119 (no definite locality).
1867. *Fiber zibethicus varius* Fitzinger, Sitzungsber. k. Akad. Wiss., Berlin, 56:47, a renaming of *F. z. maculosa* Richardson.
1867. *Fiber zibethicus niger* Fitzinger, Sitzungsber. k. Akad. Wiss., Berlin, 56:47, a renaming of *F. z. nigra* Richardson.

MARGINAL RECORDS (Hall and Cockrum, 1953:470, unless otherwise noted).—Quebec: Lake Nichikun, N of Lake Mistassini; Ste. Anne de Monts, thence along coast to New Jersey: Mullica and Wading River meadows (Connor, 1953:234). Pennsylvania: Carlisle. Virginia: Blacksburg. South Carolina: Greenville. Georgia: Hogansville. Alabama: Seale; Coffeeville. Arkansas: Ozark. Kansas: *Arkansas City;* Hamilton; *Neosho Falls.* Iowa: Burlington; Ames. Minnesota: S end Ten Mile Lake. Ontario: Quetico Park.

Genus Lemmus Link—Lemmings

American forms revised by W. B. Davis, Murrelet, 25: 19–25, September 19, 1944.

1795. *Lemmus* Link, Beyträge zur Naturgeschichte, 1(2): 75. Type, *Mus lemmus* Linnaeus.

External measurements: 120–160; 18–26; 18–23. Weight up to 113 grams; basal length, 28.8–31.4; zygomatic breadth, 19.7–22.0. Pelage long, with much reddish; form heavy, thickset; plantar pads vestigial; sole heavily haired; legs short; tail not projecting beyond hind feet in study skins; ear much reduced; mammae 2–2 = 8. Skull exceptionally massive, with extreme of interorbital constriction; temporal ridges fused into sharp median interorbital crest; zygomata widely divergent; tooth-rows widely divergent posteriorly; tympanic bullae large; outer salient angles and infolds deeper on outer than inner side of upper molars and deeper on inner, than on outer, side of lower molars.

KEY TO NOMINAL SPECIES OF LEMMUS

1. Pelage short (15–18 mm. on rump); hind feet black; auditory bullae small (8 x 6 mm.). *L. nigripes*, p. 758
1′. Pelage long (26–28 mm. on rump); hind feet whitish; auditory bullae large (10 x 7 mm.). *L. trimucronatus*, p. 759

Lemmus nigripes (True)
Black-footed Lemming

1894. *Myodes nigripes* True, Diagnoses of new North American mammals, p. 2, April 24 (preprint of Proc. U. S. Nat. Mus., 17:242, November 15, 1894), type from St. George Island, Pribilof Islands, Alaska. Known only from type locality except as introduced on St. Paul Island (see O'Malley, Science, n.s., 63:596, June 11, 1926).
1896. *L[emmus]. nigripes*, Miller, N. Amer. Fauna, 12:37, July 23.

Average external measurements of 5 females and 2 males, respectively, are: 140, 153; 26, 20; 20.5, 21.5. Upper parts with less difference in color between anterior and posterior areas than in *L. trimu-*

cronatus, at least in summer pelage, and pelage shorter, both in winter and summer; hind feet black in all known specimens, in all seasons and at all ages; tympanic bullae smaller than in *L. trimucronatus*.

Lemmus trimucronatus
Brown Lemming

External measurements: 122–160; 18–23; 18–23; 8–11. Weight of adult males, of *L. t. alascensis* from northern Alaska, up to 113 grams. Upper parts anteriorly grizzled grayish (summer) to grizzled tawny (winter); rump varying from dark chestnut to rusty or burnt umber (summer) and from tawny to fulvous (winter); sides varying from light ochraceous-buff to cinnamon (summer) and from fuscous to cinnamon (winter); underparts washed with buff. The number of embryos for 12 females from northern Alaska averaged 7.3 (4–11).

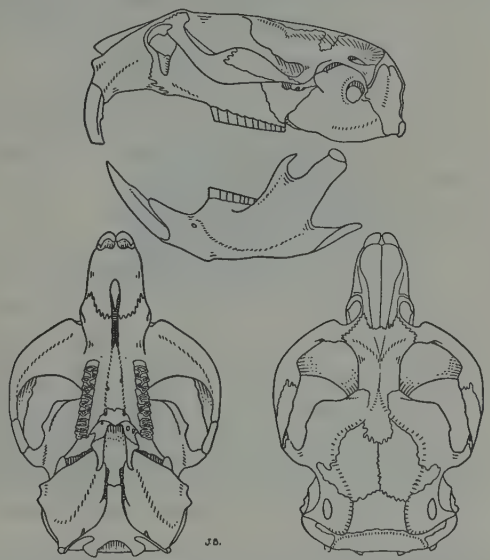
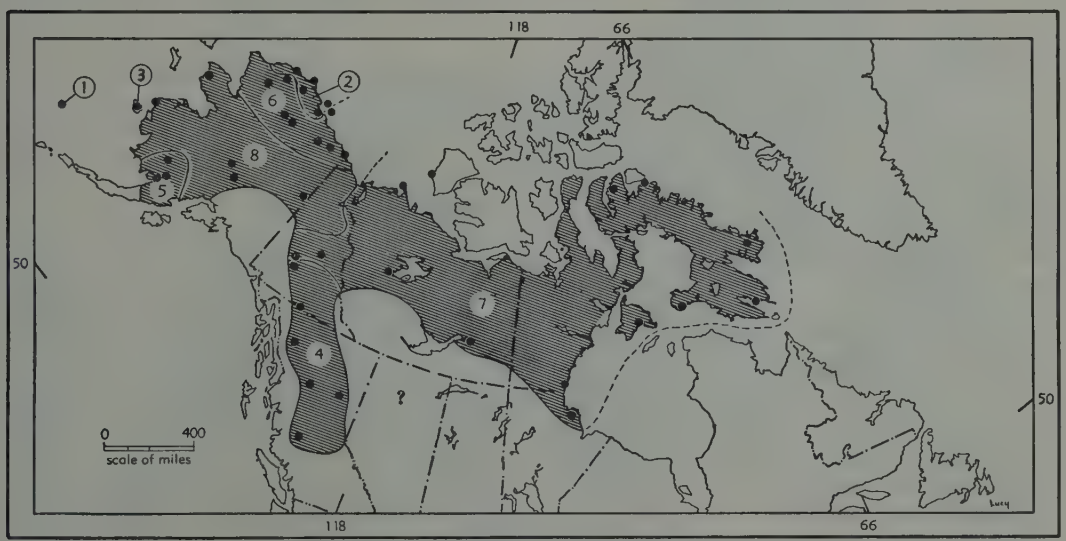


Fig. 419. *Lemmus trimucronatus alascensis*, 1⅝ mi. S and ⅝ mi. E Barrow Village, long. 156° 45′ 25″ W, lat. 71° 16′ 20″ N, 20 ft., Alaska, No. 50838 K.U., ♂, X 1½.



Map 424. *Lemmus nigripes* and *Lemmus trimucronatus*.

1. *L. nigripes*
2. *L. t. alascensis*
3. *L. t. harroldi*
4. *L. t. helvolus*
5. *L. t. minusculus*
6. *L. t. subarcticus*
7. *L. t. trimucronatus*
8. *L. t. yukonensis*

Lemmus trimucronatus alascensis Merriam

1900. *Lemmus alascensis* Merriam, Proc. Washington Acad. Sci., 2:26, March 14, type from Point Barrow, Alaska.
1937. *Lemmus trimucronatus alascensis,* Anderson, Mammals and birds of the western Arctic district, Northwest Territories, Canada, p. 110, *in* Canada's Western Northland, Dept. Mines and Resources, Ottawa, July 9.

MARGINAL RECORDS (Bee and Hall, 1956:108–109).—Alaska: type locality; 30 mi. N Thetis Island; Colville Delta; Topagaruk; Wainwright, then along coast to point of beginning.

Lemmus trimucronatus harroldi Swarth

1931. *Lemmus harroldi* Swarth, Proc. Biol. Soc. Washington, 44:101, October 17, type from Nunivak Island, Alaska. Known only from type locality.
1944. *Lemmus trimucronatus harroldi,* Davis, Murrelet, 25: 23, September 19.

Lemmus trimucronatus helvolus (Richardson)

1828. *Arvicola* (*Lemmus*) *helvolus* Richardson, Zool. Jour., 3:517, type from near the headwaters of one of the southern tributaries of Peace River, or between there and Jasper House region, Alberta (Preble, N. Amer. Fauna, 27:182, October 26, 1908).
1944. *Lemmus trimucronatus helvolus,* Davis, Murrelet, 25:22, September 19.

MARGINAL RECORDS (Hall and Cockrum, 1953:473, unless otherwise noted).—Yukon: Tantalus (Bee and Hall, 1956:113). British Columbia: Laurier Pass; Stuie; Sustut Mts., 25 mi. SE Thudade Lake; Telegraph Creek. Yukon: Teslin Lake (Bee and Hall, 1956:113). Also possibly *Alberta: ? Rocky Mountain region of northwestern Alberta.*

Lemmus trimucronatus minusculus Osgood

1904. *Lemmus minusculus* Osgood, N. Amer. Fauna, 24:36, November 23, type from Kakhtul River, near its junction with the Malchatna River, Alaska.
1944. *Lemmus trimucronatus minusculus,* Davis, Murrelet, 25:23, September 19.

MARGINAL RECORDS (Hall and Cockrum, 1953:473).—Alaska: Upper Forks Chalitna River; type locality; Nushagak River near Kakwok.

Lemmus trimucronatus subarcticus Bee and Hall

1956. *Lemmus trimucronatus subarcticus* Bee and Hall, Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 8:109, March 10, type from Lake Schrader, long. 145° 09′ 50″ W, lat. 69° 24′ 28″ N, 2900 ft., Brooks Range, Alaska.

MARGINAL RECORDS (Bee and Hall, 1956:112).—Alaska: 10 mi. N Pingok Island; S to coast and E along it to Demarcation Point; Mt. Mary, S end Lake Peters; Wahoo Lake; Tulugak Lake; Chandler Lake; 2 mi. W Utukok River, long. 161° 15′ 30″ W, lat. 68° 54′ 50″ N, 1275 ft.; Kaolak; *Kaolak River, long. 159° 47′ 40″ W, lat. 70° 11′ 15″ N, 30 ft.*

Lemmus trimucronatus trimucronatus (Richardson)

1825. *Arvicola trimucronata* Richardson, *in* Parry, Journal of a second voyage . . . , app., p. 309, type from Point Lake, Mackenzie.
1900. *Lemmus trimucronatus,* Stone, Proc. Acad. Nat. Sci. Philadelphia, 52:35, March 24.

MARGINAL RECORDS (Hall and Cockrum, 1953:473, unless otherwise noted).—Franklin (Baffin Island): Strathcona Sound; Pond Inlet; Pangnirtung Fjord; Bishop Island, Frobisher Bay; Cape Dorset. Keewatin: Coral Harbor, Southampton Island; 50 mi. S Cape Eskimo. Manitoba: Churchill (Quay, 1955:123). Mackenzie: Artillery Lake; Fort Franklin. Yukon (recorded as subspecies *alascensis,* but Bee and Hall, Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 8:113, March 10, 1956, by carelessly omitting mention of these imply that they are subspecies *trimucronatus*): near mouth Russell Creek; Rink Rapids. Mackenzie: Baillie Island, Cape Bathurst (Bee and Hall, 1956:113). Franklin: Cape Kellett, Banks Island.

Lemmus trimucronatus yukonensis Merriam

1900. *Lemmus yukonensis* Merriam, Proc. Washington Acad. Sci., 2:27, March 14, type from Charlie Creek, Yukon River, Alaska.
1956. *Lemmus t*[*rimucronatus*]. *yukonensis* Bee and Hall, Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 8:113, March 10.
1843. ? *Myodes albigularis* Wagner, *in* Schreber, Die Säugthiere . . . , Suppl., p. 602, according to Hinton (Monograph of the voles and lemmings . . . , 1926, p. 207) may be from the NW coast of North America. If identifiable, this name might apply to one of the kinds of *Lemmus* currently bearing a name proposed at a later date.

MARGINAL RECORDS.—Alaska: type locality; head of Toklat River, McKinley Range (Bee and Hall, 1956:113); Glacier Creek, McKinley Range (*ibid.*); Hooper Bay (Hall and Cockrum, 1953:472, recorded as *L. t. alascensis*); Grantley Harbor (*ibid.*).

Genus Synaptomys Baird—Bog Lemmings

Revised by A. B. Howell, N. Amer. Fauna, 50:ii + 38, August 5, 1927.

1858. *Synaptomys* Baird, Mammals, *in* Repts. Expl. and Surv. . . . , 8(1):558, July 14. Type, *Synaptomys cooperi* Baird.

External measurements: 118–154; 16–27; 16–24. Basal length of skull, 22–26; zygomatic breadth, 15.0–17.7. Pelage long and loose; tail averaging slightly longer than hind foot; soles of feet not heavily haired; plantar pads 6; mammae 6 or 8. Supraorbital ridges forming median interorbital crest in adults; squamosal crests well developed; rostrum thick and short (less than 25 per cent of total length of skull); tympanic bullae large; upper incisors broad and prominently grooved; molars rootless, with persistent pulp; roots of mandibular incisors on lingual sides of molars; re-entrant angles excessively deep on buccal sides of upper molars and on lingual sides of lower molars; M3 with 4 simple, transverse loops, peculiarly arranged; external form not highly specialized.

KEY TO SPECIES OF SYNAPTOMYS

1. None of the hairs at base of ears appreciably brighter than remainder of pelage; mammae 6; mandibular molars with triangles on outer side; palate with broad, blunt median projection. . . . . *S. cooperi*, p. 761
1′. A few hairs at base of ears distinctly brighter (with bright rusty tinge) than remainder of pelage; mammae 8; mandibular molars without triangles on outer side; palate with sharply pointed median projection pointed backward. . . . . *S. borealis*, p. 763

Subgenus Synaptomys Baird

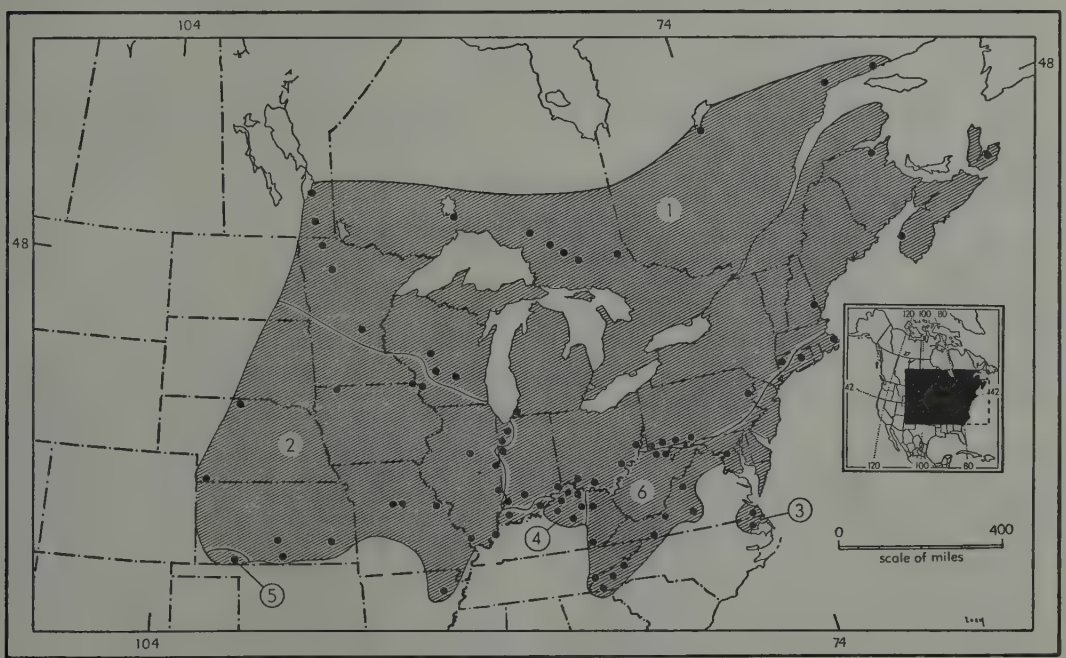
Revised by Wetzel, Jour. Mamm., 36:1–20, February 25, 1955.

1858. *Synaptomys* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):558, July 14. Type, *Synaptomys cooperi* Baird.

Mandibular molars with closed triangles on outer sides; outer re-entrant angles well developed; mandibular incisors heavy, outer edges never noticeably unworn or prolonged into sharp splinters of enamel; palate with poorly developed posterior spinous process; no hairs at base of ears appreciably brighter than remainder of pelage; mammae 1–2 = 6.

Synaptomys cooperi
Southern Bog Lemming

External measurements: 118–154; 13–24; 16–24; 8–14. Weight, 21.4–50 grams. Upper parts varying from bright cinnamon to sayal brown, often heavily suffused with black; underparts plumbeous; for additional characters see account of subgenus. Nine females from Kansas had an average of 3.5 (1–7) embryos; the mode was 3.



Map 425. *Synaptomys cooperi*.

1. *S. c. cooperi*
2. *S. c. gossii*
3. *S. c. helaletes*
4. *S. c. kentucki*
5. *S. c. paludis*
6. *S. c. stonei*

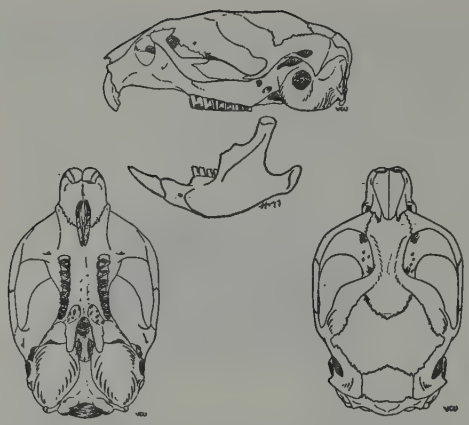


Fig. 420. *Synaptomys cooperi gossii*, 1 mi. W Lawrence, Douglas Co., Kansas, No. 4626 K.U., ♂, X 1½.

Synaptomys cooperi cooperi Baird

1858. *Synaptomys cooperi* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):558, July 14, type locality fixed by Bole and Moulthrop, Sci. Publ. Cleveland Mus. Nat. Hist., 5:146, September 11, 1942, at Jackson, Carroll Co., New Hampshire.
1896. *Synaptomys fatuus* Bangs, Proc. Biol. Soc. Washington, 10:47, March 9, type from Lake Edward, Quebec.

MARGINAL RECORDS (Wetzel, 1955:12–14, unless otherwise noted).—Quebec: Lake Mistassini (Hall and Cockrum, 1953:475); St. Margaret River; Mingan. New Brunswick: Miramichi Road, 15 mi. from Bathurst. Nova Scotia: Cape Breton Island; Digby. New Hampshire: Durham. Connecticut: Macedonia Park. Pennsylvania: Bushkill Creek; Warfordsburg; Somerset; Markleysburg; Waynesburg. Ohio: Powhatan Point; Athens; Meags; *Ripley*; Owensville. Indiana: Bascom; Mitchell; Bicknell; Warren Co. Michigan: Warren Woods. Wisconsin: Kilbourn; Camp Douglas (Hall and Cockrum, 1953:476—on geographic grounds); Withee. Minnesota: Elk River; Itasca State Park, in Clearwater Co.; Roseau Co. (Hall and Cockrum, 1953:475). Manitoba (Hall and Cockrum, 1953:475): near Dawson, Sandilands Forest Reserve; Pine Falls. Ontario: Lake Nipigon (Hall and Cockrum, 1953:475); Franz (*ibid.*); Chapleau; Ridout; Biscatasing; Timagami.

Synaptomys cooperi gossii (Coues)

1877. *Arvicola* (*Synaptomys*) *gossii* Coues, *in* Coues and Allen, Monogr. N. Amer. Rodentia, p. 235 (published as synonym of *Synaptomys cooperi*, but name stated to apply to Kansan specimens, description and measurements of which are printed on p. 236), type from Neosho Falls, Woodson Co., Kansas.
1897. *Synaptomys cooperi gossii*, Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 49:307, June.
1942. *Synaptomys cooperi saturatus*, Bole and Moulthrop, Sci. Publ. Cleveland Mus. Nat. Hist., 5:149, September 11, type from Bloomington, McLean Co., Illinois.

MARGINAL RECORDS (Wetzel, 1955:16–17, unless otherwise noted).—Iowa: Lansing (Polder, 1953:723). Wisconsin: Lynxville. Indiana (Mumford and Handley, 1956: 411): Hebron; Roselawn. Illinois: Bloomington; *Le Roy; Muncie*; Kickapoo State Park; Flat Rock. Indiana (Mumford and Handley, 1956:411): Winslow; Henryville. Illinois: Rosiclare; Alto Pass. Arkansas: Lake City. Missouri: Horseshoe Lake; Ashland; Bellair. Kansas: type locality; 3 mi. N, 1 mi. E Sharon (Hall and Cockrum, 1953:476); Little Salt Marsh. Nebraska: 5 mi. N, 2 mi. W Parks (Jones, 1954:486); Valentine. Iowa: Dickinson Co.

Synaptomys cooperi helaletes Merriam

1896. *Synaptomys helaletes* Merriam, Proc. Biol. Soc. Washington, 10:59, March 19, type from Dismal Swamp, Norfolk Co., Virginia.
1927. *Synaptomys cooperi helaletes*, A. B. Howell, N. Amer. Fauna, 50:9, August 5.

MARGINAL RECORDS (Wetzel, 1955:16).—Virginia: Lake Drummond; *type locality*. North Carolina: Chapanoke.

Synaptomys cooperi kentucki Barbour

1956. *Synaptomys cooperi kentucki* Barbour, Jour. Mamm., 37:414, September 11, type from Sadieville, Scott Co., Kentucky.

MARGINAL RECORDS.—Kentucky (Barbour, 1956: 416): Maysville; *2 mi. W Flemingsburg*; 3 mi. E Owingsville; *4 mi. E Waco*; Richmond; 1 mi. E Lawrenceburg; Kleber Sanctuary, 2 mi. N Franklin Co. line on Kentucky Highway No. 368, 1 mi. N Milford.

Synaptomys cooperi paludis Hibbard and Rinker

1942. *Synaptomys cooperi paludis* Hibbard and Rinker, Univ. Kansas Sci. Bull., 28:26, May 15, type from Meade County State Park, Meade Co., Kansas. Known only from type locality.

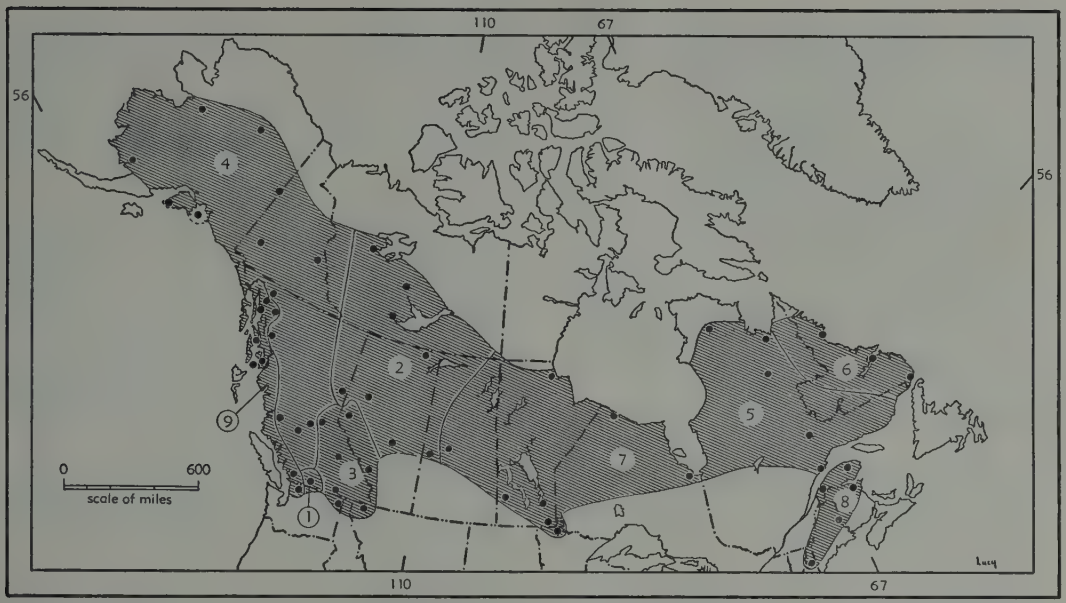
Synaptomys cooperi stonei Rhoads

1893. *Synaptomys stonei* Rhoads, Amer. Nat., 27:53, January, type from May's Landing (on Egg River), Atlantic Co., New Jersey.
1897. *Synaptomys cooperi stonei* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 49:305, June.

MARGINAL RECORDS (Wetzel, 1955:15, unless otherwise noted).—Massachusetts: Plymouth, thence south along Atlantic Ocean and Chesapeake Bay and up E side Potomac River to Maryland: Hyattsville. Virginia: Elliot Knob; Campbell Co. (Hall and Cockrum, 1953:476); Blacksburg; White Top Mtn. North Carolina: Mt. Mitchell; Weaverville; Highlands (Hall and Cockrum, 1953:476); *Great Smoky Mts. National Park at Indian Gap*. Tennessee: Great Smoky Mts. National Park at Upper Greenbriar Cove. Kentucky (Barbour, 1956:414): Goldbug; Morehead. West Virginia: Morgantown; Terra Alta. Connecticut: Mansfield.

Subgenus Mictomys True

1894. *Mictomys* True, Diagnoses of new North American mammals, p. 2, April 24 (preprint of Proc. U. S. Nat. Mus., 17:242, November 15, 1894). Type, *Mictomys innuitus* True.



Map 426. *Synaptomys borealis.*

1. *S. b. artemisiae*
2. *S. b. borealis*
3. *S. b. chapmani*
4. *S. b. dalli*
5. *S. b. innuitus*
6. *S. b. medioximus*
7. *S. b. smithi*
8. *S. b. sphagnicola*
9. *S. b. wrangeli*

Mandibular molars without closed triangles on outer sides, and almost no outer re-entrant angles; mandibular incisors relatively slender and sharply pointed; palate with well-developed spinous process behind; few hairs at bases of ears appreciably brighter than remainder of pelage. Mammae 2–2 = 8.

Synaptomys borealis
Northern Bog Lemming

External measurements: 118–135; 19–27; 16–22; 12–13. Weight, 32–34 grams (2 individuals). Upper parts varying from grizzled gray to Brussels Brown, with admixture of black hairs; underparts plumbeous; tail bicolored; feet grayish to almost black; for additional characters see account of subgenus.

Synaptomys borealis artemisiae Anderson

1932. *Synaptomys borealis artemisiae* Anderson, Bull. [Ann. Rep. for 1931] Nat. Mus. Canada, 70:104, November 24, type from Stevenson Creek, SW Princeton, British Columbia, on Hope-Princeton Trail, east slope Cascade Range, 2400 ft., lat. 49° 23′ N, long. 120° 35′ W.

MARGINAL RECORDS.—British Columbia (Anderson, 1947:145): type locality; *Whipsaw Creek, 5600 ft.*

Synaptomys borealis borealis (Richardson)

1828. *Arvicola borealis* Richardson, Zool. Jour., 3:517, type from Fort Franklin, Great Bear Lake, Mackenzie.
1907. *Synaptomys borealis,* Osgood, Proc. Biol. Soc. Washington, 20:49, April 18.
1902. *Synaptomys* (*Mictomys*) *bullatus* Preble, Proc. Biol. Soc. Washington, 15:181, August 6, type from Trout Rock, near Fort Rae, Great Slave Lake, Mackenzie.

MARGINAL RECORDS (Hall and Cockrum, 1953:478).—Mackenzie: Fort Franklin; Sarahk Lake. Alberta: Smith Landing (Fitzgerald). Saskatchewan: Brightsand Lake,

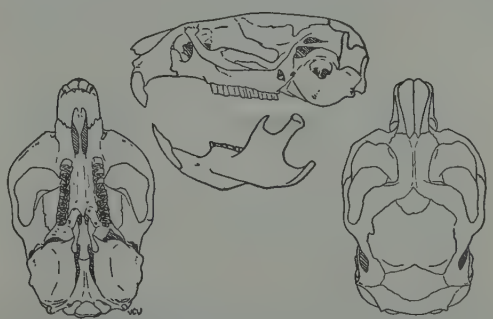


Fig. 421. *Synaptomys borealis dalli,* McIntyre Creek, 2250 ft., 3 mi. NW Whitehorse, Yukon, No. 21332 K.U., ♀, X 1½.

about 65 mi. NNW North Battleford. Alberta: "Edmonton district"; Peace River Landing. British Columbia: near Tupper Creek School House; *"Peace River block in northeastern British Columbia."* Mackenzie: Fort Providence.

Synaptomys borealis chapmani J. A. Allen

1903. *Synaptomys (Mictomys) chapmani* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:555, October 10, type from Glacier, Selkirk Range, British Columbia.
1927. *Synaptomys borealis chapmani,* A. B. Howell, N. Amer. Fauna, 50:9, August 5.

MARGINAL RECORDS.—Alberta (Hall and Cockrum, 1953:478): Ray Lake; Mt. Forget-me-Not. Montana (*ibid.*): Camas Creek in Glacier National Park. Washington: Sema Meadows, 3000 ft. (Johnson and Cheney, 1953:10). British Columbia (Cowan and Guiguet, 1956: 198): Rossland; Mt. Revelstoke; Indianpoint Lake.

Synaptomys borealis dalli Merriam

1896. *Synaptomys (Mictomys) dalli* Merriam, Proc. Biol. Soc. Wash., 10:62, March 19, type from Nulato, Alaska.
1927. *Synaptomys borealis dalli,* A. B. Howell, N. Amer. Fauna, 50:9, August 5.
1903. *Synaptomys (Mictomys) andersoni* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:554; October 10, type from Level Mts., northern British Columbia.

MARGINAL RECORDS (Hall and Cockrum, 1953:478, unless otherwise noted).—Alaska: Bettles; mountains near Eagle. Yukon: Canol Road, Mile 249. British Columbia: Sixteen Mile Lake; Chezacut Lake (Cowan and Guiguet, 1956:199); Caribou Mtn., near Stuie; Telegraph Creek; Atlin. Yukon: Burwash Landing. Alaska: Prince William Sound; Seldovia; *Cape Ugyak* (Schiller and Rausch, 1956: 197); *Brooks River* (*ibid.*); Lake Aleknagik; type locality.

Synaptomys borealis innuitus (True)

1894. *Mictomys innuitus* True, Diagnoses of new North American mammals, p. 3, April 24 (preprint of Proc. U.S. Nat. Mus., 17:243, November 15), type from Fort Chimo, Quebec.
1927. *Synaptomys borealis innuitus,* A. B. Howell, N. Amer. Fauna, 50:9, August 5.

MARGINAL RECORDS (Hall and Cockrum, 1953:478, unless otherwise noted).—Quebec: Payne Lake, lat. 59° 30′ N, long. 74° W (Banfield, 1956:99); type locality; upper part Ste. Marguerite River, about 100 mi. N Gulf of St. Lawrence; Godbout; Rattogobas Lake, Swampy Bay River.

Synaptomys borealis medioximus Bangs

1900. *Synaptomys (Mictomys) innuitus medioximus* Bangs, Proc. New England Zool. Club, 2:40, September 20, type from L'Anse au Loup, Strait of Belle Isle, Labrador.
1927. *Synaptomys borealis medioximus,* A. B. Howell, N. Amer. Fauna, 50:9, August 5.

MARGINAL RECORDS (Hall and Cockrum, 1953:479).—Labrador: Nain; Hamilton Inlet; type locality.

Synaptomys borealis smithi Anderson and Rand

1943. *Synaptomys borealis smithi* Anderson and Rand, Canadian Field-Nat., 57:101, December 10, type from Thicket Portage, Mile 165, H. B. Railroad, Manitoba.

MARGINAL RECORDS (Hall and Cockrum, 1953:479, unless otherwise noted).—Manitoba: Churchill (Quay, 1955: 123). Ontario: Port Severn; Moosonee. Minnesota: Williams. Manitoba: near the Dawson Cabin, N part Sandilands Forest Reserve; near Pine Falls, Winnipeg River; Clear Lake, Riding Mtn. National Park. Saskatchewan: E of Nesslin Lake, Prince Albert National Park (Soper, 1952:34).

Synaptomys borealis sphagnicola Preble

1899. *Synaptomys (Mictomys) sphagnicola* Preble, Proc. Biol. Soc. Washington, 13:43, May 29, type from Fabyans, Coos Co., New Hampshire.
1927. *Synaptomys borealis sphagnicola,* A. B. Howell, N. Amer. Fauna, 50:9, August 5.

MARGINAL RECORDS (Hall and Cockrum, 1953:479).—Quebec: Tabletop Mtn. New Brunswick: Miramichi Road, 15 mi. from Bathurst. Maine: Mt. Katahdin. New Hampshire: type locality. Quebec: Ste. Rose.

Synaptomys borealis wrangeli Merriam

1896. *Synaptomys (Mictomys) wrangeli* Merriam, Proc. Biol. Soc. Washington, 10:63, March 19, type from Wrangell, Alexander Archipelago, Alaska.
1927. *Synaptomys borealis wrangeli,* A. B. Howell, N. Amer. Fauna, 50:9, August 5.
1896. *Synaptomys (Mictomys) truei,* Merriam, Proc. Biol. Soc. Washington, 10:62, March 19, type from Skagit Valley, Skagit Co., Washington.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:199): Atlin Lake; Great Glacier. Alaska: Anan Creek (Hall and Cockrum, 1953:479). British Columbia (Cowan and Guiguet, 1956:199): Alta Lake; *Allison Pass.* Washington: Mt. Baker (Hall and Cockrum, 1953:479). British Columbia: Metlakatla (Cowan and Guiguet, 1956:199). Alaska: type locality; Port Snettisham (Hall and Cockrum, 1953:479).

Genus Dicrostonyx Gloger—Collared Lemmings

Revised by G. M. Allen, Bull. Mus. Comp. Zool., 62: 509–540, February, 1919. Canadian forms treated by Anderson and Rand, Jour. Mamm., 26:301–306, November 14, 1945.

1841. *Dicrostonyx* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, 1:97. Type, an American species, probably *Mus hudsonius* Pallas.
1854. *Myolemmus* Pomel, Catal. Method., p. 27. Type, *Arvicola ambiguus* from the Pleistocene of France. According to Hinton (Monograph of the voles and lemmings . . . , 1926, p. 137), *Arvicola ambiguus* is an unidentifiable species.
1855. *Misothermus* Hensel, Zeitschr. der Deutsch geol. Gesell., 7:492. Type, *Mus torquatus* Pallas.
1881. *Borioikon* Poljakov, Mem. Acad. Imp. Sci. St. Pétersbourg, 39: Supplement, p. 34. Type, *Mus torquatus* Pallas.
1897. *Tylonyx* Schulze, Mamm. Europaea in Helios, Abhandl. und Vorträge Gesammtgebiete Naturwiss., Berlin, 14:83. Type, *Mus torquatus* Pallas.

External measurements: 132–160; 10–22; 15–24; 6. Weight, 45–75 grams; basal length of skull, 25.0–

30.5; zygomatic breadth, 17.6–23.1. Ears entirely concealed in fur; foot-soles densely haired. In summer, upper parts brownish gray, buffy gray or variegated tawny and gray with black mid-dorsal stripe in some specimens; underparts (*D. g. rubricatus*) whitish but hairs plumbeous basally and lightly tipped with tawny. In winter all white (*D. g. unalascensis* and *D. g. stevensoni* excepted); white animals with foreclaws of digits 3 and 4 each with bulbous ventral part as large as dorsal part and separated from dorsal part by lateral groove and notch at end; ventral part absent in summer. Skull with squamosal pegs projecting anterolaterally behind orbits; tympanic bullae cancellous; lower incisor not extending behind m3; m1 with 7 closed triangles between terminal loops.

So far as known the collared, or varying, lemming occurs only in the treeless parts of the Arctic. It lives in short burrows; embryos number 3 to 11; some females produce 2 litters in a summer. This is the only rodent known to turn white in winter.

KEY TO SPECIES OF DICROSTONYX

1. First and second upper cheek-teeth without an accessory fold at the posterointernal corner; last lower molar normally lacking an accessory anterointernal fold and an anteroexternal enamel fold. . . . *D. hudsonius*, p. 767
1′. First and second upper cheek-teeth with small accessory enamel fold at posterointernal corner; last lower molar provided with accessory anterointernal enamel fold, and, in some forms, with anteroexternal accessory fold.
2. Restricted to St. Lawrence Island. *D. exsul*, p. 767
2′. Not on St. Lawrence Island; on Alaska Peninsula and North American mainland north of 58°. . . . *D. groenlandicus*, p. 765

Dicrostonyx groenlandicus
Collared Lemming

External measurements: 132–157; 10–20; 15–22. In summer, upper parts grizzled gray to grayish brown with more or less distinct dorsal blackish stripe; underparts grayish white, usually tinged with buff. All white in winter. M1 and M2 usually each with well-developed posterointernal vestigial angle and hind walls of posterointernal triangles retaining thick enamel and concave form; m3 usually with pair of anterior vestigial angles. In *D. g. richardsoni* three is the usual number of embryos and some females have 2 litters in the short summer season. In *D. g. alascensis* the number of embryos ranges from 5 to 11 (G. M. Allen, 1919:523, 529).

Ognev (1948:479, 508) regards *D. groenlandicus* as conspecific with the earlier named *D. torquatus*.

Dicrostonyx groenlandicus clarus Handley

1953. *Dicrostonyx groenlandicus clarus* Handley, Jour. Washington Acad. Sci., 43:197, June 24, type from near sea-level at Cherie Bay, 5¾ mi. ENE Mould Bay Station (lat. 76° 19′ N, long. 119° 02′ W), Prince Patrick Island, Franklin.

MARGINAL RECORDS (Handley, 1953:198).—Franklin: south coast, South Borden Island; Winter Harbor, Melville Island; Liddon Gulf, Melville Island; type locality.

Dicrostonyx groenlandicus groenlandicus (Traill)

1823. *Mus groenlandicus* Traill, *in* Scoresby, Journal of voyage to the northern whale-fishery . . . , p. 416, type from Jamesons Land, Greenland.
1919. *Dicrostonyx groenlandicus*, G. M. Allen, Bull. Mus. Comp. Zool., 62:533, February.

MARGINAL RECORDS (Hall and Cockrum, 1953:481, unless otherwise noted).—Greenland: "northeast Greenland, N to 83° 24′"; type locality. Franklin (Baffin Island): Pangnirtung Fjord (Anderson and Rand, 1945:304). Keewatin: Coral Harbour, Southampton Island; Baker Lake. Franklin: Iglulik Island, Fury and Hecla Strait; Axel Heiberg Island.

Dicrostonyx groenlandicus kilangmiutak Anderson and Rand

1945. *Dicrostonyx groenlandicus kilangmiutak* Anderson and Rand, Jour. Mamm., 26:305, November 14, type from DeHaven Point, southeastern point of Victoria Island, west side Victoria Strait, Franklin, approximately lat. 69° N, long. 101° 30′ W.

MARGINAL RECORDS (Hall and Cockrum, 1953:482).—Franklin: Cape Kellett, Banks Island; Taylor Island. Keewatin: Queen Maud Sea area. Mackenzie: Sifton Lake; Aklavik.

Dicrostonyx groenlandicus lentus Handley

1953. *Dicrostonyx groenlandicus lentus* Handley, Jour. Washington Acad. Sci., 43:198, June 24, type from Lake Harbor (lat. 62° 43′ N, long. 69° 41′ W), Baffin Island, Franklin.

MARGINAL RECORDS (Handley, 1953:199).—Franklin (Baffin Island): Netilling Lake; Cape Mercy; type locality; Bowdoin Harbor (Schooner Harbor); Bowman Bay (Camp Kungovik).

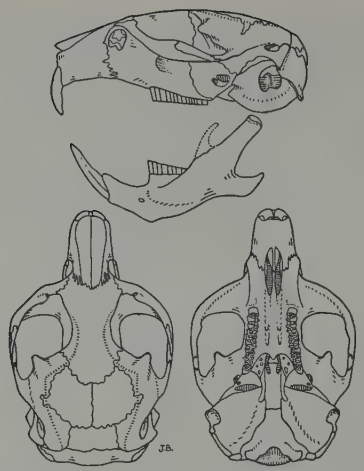


Fig. 422. *Dicrostonyx groenlandicus rubricatus*, Kaolak River, long. 159° 47′ 40″ W, lat. 70° 11′ 15″ N, 30 ft., Alaska, No. 43324 K.U., ♂, X 1½.

Dicrostonyx groenlandicus nelsoni Merriam

1900. *Dicrostonyx nelsoni* Merriam, Proc. Washington Acad. Sci., 2:25, March 14, type from St. Michael, Norton Sound, Alaska.

1953. *Dicrostonyx groenlandicus nelsoni*, Handley, Jour. Washington Acad. Sci., 43:200, June 24.

MARGINAL RECORDS.—Alaska: near Nome (Quay, 1951:93, as *D. g. rubricatus*); Russian Mission (Hall and Cockrum, 1953:484, as *D. g. rubricatus*); type locality.

Dicrostonyx groenlandicus peninsulae Handley

1953. *Dicrostonyx unalascensis peninsulae* Handley, Jour. Washington Acad. Sci., 43:199, June 24, type from near sea-level at Urilla Bay, Unimak Island, Alaska.

MARGINAL RECORDS (Handley, 1953:200).—Alaska: Nushagak; Chignik; type locality; Muller [= Moller] Bay.

Dicrostonyx groenlandicus richardsoni Merriam

1900. *Dicrostonyx richardsoni* Merriam, Proc. Washington Acad. Sci., 2:26, March 14, type from Fort Churchill, Manitoba.

1935. *Dicrostonyx groenlandicus richardsoni*, Degerbøl, Rept. Fifth Thule Exped., Mammals, 2:9.

Map 427. American *Dicrostonyx*.

1. *D. groenlandicus clarus*
2. *D. groenlandicus groenlandicus*
3. *D. groenlandicus kilangmiutak*
4. *D. groenlandicus lentus*
5. *D. groenlandicus nelsoni*
6. *D. groenlandicus peninsulae*
7. *D. groenlandicus richardsoni*
8. *D. groenlandicus rubricatus*
9. *D. groenlandicus stevensoni*
10. *D. groenlandicus unalascensis*
11. *D. exsul*
12. *D. hudsonius*

MARGINAL RECORDS (Hall and Cockrum, 1953:482).—Mackenzie: Artillery Lake. Keewatin: Kazan River; Tavani. Manitoba: type locality.

Dicrostonyx groenlandicus rubricatus (Richardson)

1839. *Arvicola rubricatus* Richardson, The zoology of Captain Beechey's voyage . . . , p. 7, type from American side of Bering Strait, Alaska.
1937. *Dicrostonyx groenlandicus rubricatus*, Anderson, Mammals and birds of the western Arctic district, *in* Canada's Western Northland, Dept. of Mines and Resources, Ottawa, p. 110, July 9.
1900. *Dicrostonyx hudsonius alascensis* Stone, Proc. Acad. Nat. Sci. Philadelphia, 52:37, March 24, type from Point Barrow, Alaska.

MARGINAL RECORDS (Hall and Cockrum, 1953:484, unless otherwise noted).—Alaska: Point Barrow; Barter Island (Strecker, *et al.*, 1952:479). Yukon: Herschel Island. Alaska: Porcupine River, 200 mi. above Yukon; Fort Yukon; Driftwood (292997 USNM).

Dicrostonyx groenlandicus stevensoni Nelson

1929. *Dicrostonyx unalascensis stevensoni* Nelson, Proc. Biol. Soc. Washington, 30:145, pl. 2, March 30, type from Umnak Island, Alaska. Known only from type locality.
1953. *Dicrostonyx groenlandicus stevensoni*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:484, January 15.

Dicrostonyx groenlandicus unalascensis Merriam

1900. *Dicrostonyx unalascensis* Merriam, Proc. Washington Acad. Sci., 2:25, March 14, type from Unalaska, Unalaska. Known only from type locality.
1953. *Dicrostonyx groenlandicus unalascensis*, Hall and Cockrum, Univ. Kansas Publ., Mus. Nat. Hist., 5:484, January 15.

Dicrostonyx exsul G. M. Allen
St. Lawrence Island Collared Lemming

1919. *Dicrostonyx exsul* G. M. Allen, Bull. Mus. Comp. Zool., 62:532, February, type from St. Lawrence Island, Bering Sea, Alaska. Known only from type locality.

External measurements: 146; 17; 20. Upper parts in summer pinkish gray, blacker on rump; ear-patch mixture of ochraceous-buff and tawny; blackish median line indistinct; feet pale buff above in central part with whitish dusky tinge peripherally. In winter presumably all white. A subadult taken on June 24, contained 4 embryos.

Dicrostonyx hudsonius (Pallas)
Labrador Collared Lemming

1778. *Mus hudsonius* Pallas, Novae species quadrupedum e glirum ordine . . . , p. 208, type from Labrador.
1897. *Dicrostonyx hudsonius*, Bangs, Proc. Biol. Soc. Washington, 11:237, September 17.

Average external measurements of six adults: 148; 20.3; 22.1. Maximum recorded is 160, 22, 24. In summer, adults nearly uniform buffy gray above, with indistinct blackish spinal stripe; ear tufts, flanks, and throat buffy or rusty; underparts gray, usually strongly tinged with buffy; M1 and M2 each lacks posterointernal vestigial angle and with wall of hinder inner triangle reduced; m3 without anterior vestigial angles.

MARGINAL RECORDS (Hall and Cockrum, 1953:480).—Keewatin: Digges Islands. Quebec: Rama; probably Straits of Belle Isle; Lake Michikamau, Great Whale River. Keewatin: Belcher Islands.

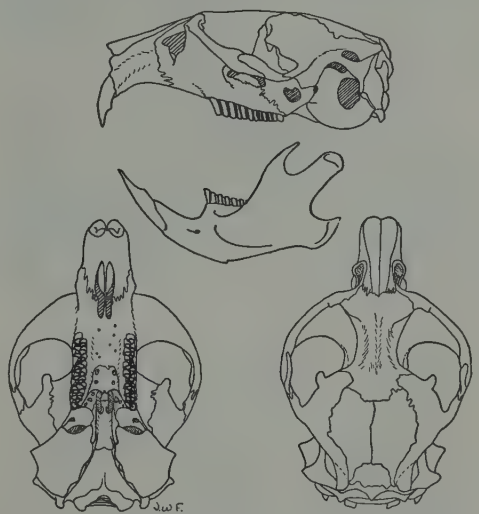


Fig. 423. *Dicrostonyx hudsonicus*, George River, Hudson Bay Post, 800 ft., Quebec, No. 29248 K.U., ♀, X 1½.

Family Muridae Gray—Murids

A characterization that applies to the particular species of Old World rats and mice that have been introduced into North America is as follows: Upper parts uniform grayish-brown to black; underparts paler. Tail long, sparsely haired, and scaly. Molars provided with small, rounded cusps (tubercles) arranged in three longitudinal rows. Palate extending posteriorly to beyond plane of last molars; palatine slits extending posteriorly to plane of anterior borders of last upper molars. Dentition, i. $\frac{1}{1}$, c. $\frac{0}{0}$, p. $\frac{0}{0}$, m. $\frac{3}{3}$

Murid mice and rats have been introduced throughout the world. The black rat (*Rattus rattus*) probably came to North America in the ships of the early explorers; the Norway rat (*Rattus norvegicus*) seems to have arrived in North America about

1775, and has since spread over most of the continent. With the exception of *Rattus rattus*, the distribution of murids in North America is closely associated with the habitations of man. In cities, villages, and on farms, house mice and Norway rats are common, and in many such areas they have driven out the native rodents. *Rattus rattus* may be found in areas far from human developments.

Damage done in North America by these rodents has been estimated at more than a quarter of a billion dollars each year, although improved methods of rat control in recent years may be reducing this figure. Indirect damages by murids may be great; they harbor and carry some diseases of humans and livestock, including trichinosis, rabies, tularemia, *Salmonella* food poisoning, typhus, and bubonic plague.

Although most authors fail to make any favorable comments concerning these introduced murids, one must remember that the common laboratory rat and laboratory mouse are but albinistic strains of *R. norvegicus* and *M. musculus*, and that the value of these experimental animals in many phases of biological research serves, in part, to offset the damage caused by their uncaged relatives.

KEY TO SPECIES OF INTRODUCED MURIDAE

1. Total length less than 250; tail less than 110; occipitonasal length less than 35; first upper molar longer than combined lengths of 2nd and 3rd upper molars. . . *Mus musculus*, p. 770
1′. Total length more than 250; tail more than 110; occipitonasal length more than 35; first upper molar shorter than combined lengths of 2nd and 3rd upper molars.
2. Tail longer than head and body; M1 with distinct outer notches on first row of cusps; length of parietal measured along temporal ridge less than distance between temporal ridges. . . . *Rattus rattus*, p. 768
2′. Tail not longer than head and body; M1 without distinct outer notches on first row of cusps; length of parietal measured along temporal ridge not less than distance between temporal ridges. *Rattus norvegicus*, p. 769

Genus Rattus Fischer—Old World Rats

1803. *Ruttus* [*sic*] Fischer, Das Nationalmuseum der Naturgeschichte zu Paris . . . , 2:128. Type, *Mus decumanus* Pallas.

1881. *Epimys* Trouessart, Bull. Soc. d'Études Sci. d'Angers, 10:117. Type, *Mus rattus* Linnaeus.

1917. *Epinomys* Elliot, A check-list of mammals of the North American continent . . . , Suppl., p. 41, March 27, an emendation of *Epimys* Trouessart.

External measurements: 320–480; 153–255; 30–44. Weight, 150–540 grams. Occipitonasal length, 39.0–51.5; zygomatic breadth, 18.1–25.2; mastoid breadth, 15.8–19.2; alveolar length of maxillary tooth-row, 6.3–7.7. Upper parts tawny to black; underparts gray to white; tail sparsely haired and scaled.

Old World rats have a high reproductive potential, which has contributed to the success of their introduction. The gestation period is 22 days, litter size varies from 6 to 22, and young may breed at 3 months of age. Under normal conditions there are from 3 to 7 litters per year.

Rattus rattus
Black Rat

External measurements: 325–455; 160–255; 30–40. Weight, 115–350 grams. Occipitonasal length, 39.0–45.4; zygomatic breadth, 18.1–21.6; alveolar length of maxillary tooth-row, 6.3–6.6. M1 with distinct outer notches on first row of cusps. Mammae, 2–3 = 10. Upper parts black to tawny; underparts slate colored to white; tail not bicolor and usually longer than head and body; ears more than 20 and naked.

At least 3 subspecies of black rat have been introduced in North America: *Rattus rattus rattus* (Linnaeus), *Rattus rattus alexandrinus* (É. Geoffroy Saint-Hilaire), and *Rattus rattus frugivorus* (Rafinesque). When first named, each of the 3 kinds was regarded as a species. Citations to the original descriptions are given immediately below.

1758. [*Mus*] *rattus* Linnaeus, Syst. nat., ed. 10, 1:61. Type locality, Uppsala, Sweden.

1803. *Mus alexandrinus* É. Geoffroy Saint-Hilaire, Catalogue des Mammifères des Muséum National d'Histoire Naturelle, Paris, p. 192. Type locality, Alexandria, Egypt.

1814. *Musculus frugivorus* Rafinesque, Précis des decouverts et travaux somiologiques . . . , p. 13. Type locality, Sicily.

[Although synonyms for the subspecific names of the non-native black rat are in the literature, we have not listed the synonyms here because none was based on a North American specimen. For

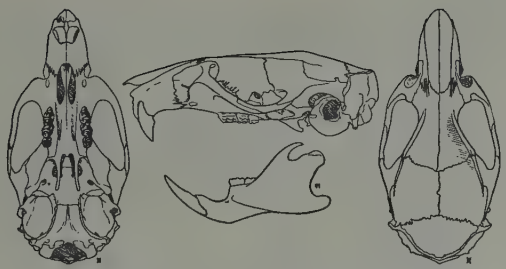


Fig. 424. *Rattus rattus alexandrinus*, Reno, Nevada, No. 94922 M.V.Z., ♀, X 1.

the Norway rat and house mouse, also non-native species, treated beyond, several synonyms are listed for the subspecies that occur in North America because some of the synonyms were based on North American specimens.]

The black rat is found in ships far more commonly than the Norway rat, and therefore it has been introduced and reintroduced in most sea ports. In the northern ports, the larger Norway rat is dominant and in most of these places has driven out the black rat. In South Atlantic and Gulf Coast ports, black rats are more common, and in recent years they have moved inland. In southern localities where both species of rats are found, the more aggressive Norway rat has forced the black rat to live in the upper portions of buildings. Black rats are the better climbers.

Because interbreeding occurs in North America between the three subspecies and because stocks from other continents have repeatedly been introduced, it is often impossible to allocate specimens to a definite subspecies. Not mapped.

Rattus norvegicus
Norway Rat

A characterization that applies to the one subspecies that has been introduced into North America is as follows: External measurements: 316–460; 122–215; 30–45. Weight, 195–485 grams. Occipitonasal length, 41.0–51.5; zygomatic breadth, 21.0–25.2; mastoid breadth, 16.0–19.2. Upper parts reddish or grayish brown to black; underparts paler, grayish to yellow-white. White, black, or mottled specimens are found occasionally. Tail bicolor, being lighter below and darker above; ears usually smaller than 20 and covered with short, fine hair. M1 without distinct notches on first row of cusps. Skull narrower across braincase than in *R. rattus*.

Norway rats breed when 3 to 4 months old and have litters of 6 to 22 young after a gestation period of 22 days. Not mapped.

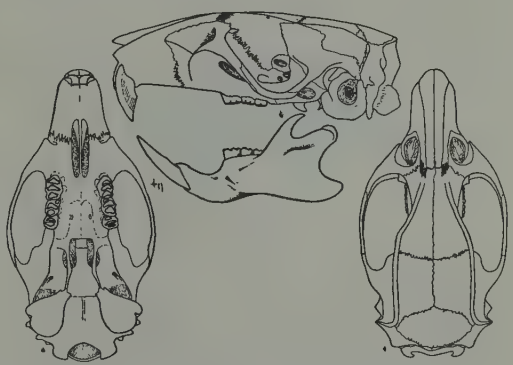


Fig. 425. *Rattus norvegicus norvegicus*, Redlands, San Bernardino Co., California, No. 77258 M.V.Z., ♂, X 1.

Rattus norvegicus norvegicus (Berkenhout)

1769. *Mus norvegicus* Berkenhout, Outlines of the natural history of Great Britain and Ireland, 1:5. Type locality, England.
1916. *Rattus norvegicus*, Hollister, Proc. Biol. Soc. Washington, 29:126, June 6.
1778. *Mus decumanus* Pallas, Novae species quadrupedeum e glirum ordine . . . , p. 91. Type locality, Europe.
1779. *M[us]. surmolottus* Severinus, Tentamen Zool. Hungaricae, p. 73. Type locality, central Europe.
1800. *M[us]. d[ecumanus]. hybridus* Bechstein, Thomas Pennant's allgemeine Uebersicht der vierfüssigen Thiere, 2:713. Type locality, Waltershausen, Germany.
1816. *Mus caspius* Oken, Lehrbuch der Naturgeschichte, 3:895, a renaming of *M. decumanus* Pallas.
1837. *Mus hibernicus* Thompson, Proc. Zool. Soc. London, p. 52, December 20. Type locality, Rathfriland, Co. Down, Ireland.
1839. *Mus maurus* Waterhouse, The Zoology of H. M. S. Beagle, Mammalia, p. 31. Type locality, America.
1841. *Mus decumanoides* Hodgson, Jour. Asiatic Soc. Bengal, 10:915, a *nomen nudum*.
1842. *Mus leucosternum* Rüppell, Mus. Senckenb., 3:108, 116. Type locality, Eritrea.
1848. *Mus maniculatus* Wagner, Arch. f. Naturgesch., 14: 186. Type locality, Egypt.

Genus Mus Linnaeus—House Mice

1758. *Mus* Linnaeus, Syst. nat., ed. 10, 1:59. Type, *Mus musculus* Linnaeus (by tautonomy).

Small, head and body usually less than 100; hind foot narrow; fifth digit longer than hallux. Skull resembling that of *Rattus*, but light, flattened, with supraorbital ridges faint or absent, and short muzzle. M1 elongated, three-rooted; crown length of M1 more than length of M2 and M3 combined; M1 with 8 cusps; M2 usually with 6 cusps; M3 small; upper incisors compressed and with subapical notch. Mammae, 3–2 = 10.

Mus musculus
House Mouse

Reviewed by Schwarz and Schwarz, Jour. Mamm., 24:59–72, February 20, 1943.

External measurements: 130–198; 63–102; 14–21; 11–18. Weight, 18–23 grams. Occipitonasal length, 20.1–22.9; zygomatic breadth, 10.6–12.1; mastoid breadth, 9.3–10.2; alveolar length of maxillary toothrow, 3.1–3.7. Upper parts light brown to black; underparts whitish, often with buffy wash. Tail not sharply bicolor, but lighter below than above. Skull as described for the family and genus.

House mice may have as many as 12 young per litter; the gestation period is 19 days; the young may breed at 35 days of age.

According to Schwarz and Schwarz (1943:59–72), this mouse rapidly evolves taxonomically distinguishable forms which are commensals of man. All wild forms are characterized by medium size, tail shorter than head and body, and underparts white. The commensal stocks tend to have longer tails, be darker, have smaller molars, and a shorter molar tooth-row.

Schwarz and Schwarz (*op. cit.*) suggest that 2 subspecies have been introduced into North America: *Mus musculus brevirostris* Waterhouse and *M. m. domesticus* Rutty. The former ranges from South America to the southern United States where *brevirostris* overlaps the range of *M. m. domesticus* that ranges from Alaska to the northern part of the central states of the United States. *Mus musculus musculus* Linnaeus has not been introduced onto this continent. The 2 subspecies and the names (synonyms) for their commensals stand as given immediately below. Not mapped.

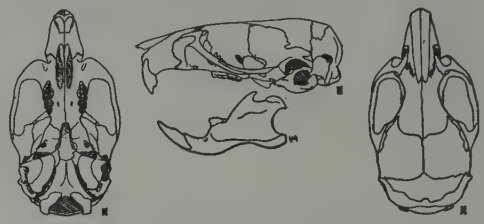


Fig. 426. *Mus musculus* subsp.? Baker, 5800 ft., White Pine Co., Nevada, No. 41874 M.V.Z., ♂, X 1½.

Mus musculus domesticus Rutty

1772. *Mus domesticus* Rutty, Essay Nat. Hist. County Dublin, 1:281. Type locality, Dublin, Ireland.
1943. *Mus musculus domesticus*, Schwarz and Schwarz, Jour. Mamm., 24:65, February 20.
1862. *H[esperomys]. indianus* Wied-Neuwied, Arch. Naturgesch., Jahrg. 28, 1:111. Type locality, New Harmony, Posey Co., Indiana.

Mus musculus brevirostris Waterhouse

1837. *Mus brevirostris* Waterhouse, Proc. Zool. Soc. London, p. 19, November 21. Type locality, Maldonado, Uruguay.
1943. *Mus musculus brevirostris*, Schwarz and Schwarz, Jour. Mamm., 24:64, February 20.
1897. *Mus musculus jalapae* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 9:198, June 16, type from Jalapa, Veracruz.
1942. *Mus musculus percnonotus* Moulthrop, Sci. Publ. Cleveland Mus. Nat. Hist., 5:79, June 1, type from Mina Carlota, Barrio de Cumanayagua, Trinidad Mts., Santa Clara, Cuba.

FAMILY ZAPODIDAE—Jumping Mice

Hind legs longer than forelegs; hind feet with 5 functional digits; tail longer than head and body; antorbital foramen large and rounded; auditory bullae not inflated; zygoma depressed; jugal prolonged and forming suture with lacrimal; molars semi-hypsodont, rooted; P4 small or absent; lower premolars absent; M2 with 4 or more narrow labial re-entrant folds; anterior and posterior cingula of M3 large; back with broad dorsal band of yellow-brown, flecked with black; sides paler than back; underparts white or suffused with color of sides; tail more or less bicolor and sparsely haired.

The jumping mice are primarily nocturnal, although they are not uncommonly seen in the daytime. They prefer open grasslands (*Zapus*) or woodlands (*Napaeozapus*), but are of rather localized distribution throughout their range. Although nowhere so abundant as some other species of mice, populations of jumping mice fluctuate. With the

coming of cold weather, they leave their nests of grass on the surface of the ground and retire to underground burrows and hibernate until spring—although they may rarely be found on the surface in midwinter. They breed in spring, and the 2 to 9 altricial young are born in early summer. There may be a second litter in September. Jumping mice eat seeds, fruits, roots, and shoots, as well as insects and spiders.

Genus Zapus Coues—Jumping Mice

Revised by Krutzsch, Univ. Kansas Publ., Mus. Nat. Hist., 7:349–472, April 21, 1954.

1876. *Zapus* Coues, Bull. U. S. Geol. and Geogr. Surv. Territories, ser. 2, 1:253, January 8. Type, *Dipus hudsonius* Zimmermann.

External measurements: 188–255; 112–155; 28–35. Back with a broad dorsal band of some shade of brown or brownish-yellow darkened with brownish-black; sides pale and slightly streaked with brownish-black; underparts snow-white, in some animals suffused with color of sides by sharp line of clear brownish-yellow; tail bicolor, dark brown above, yellowish-white below. Upper premolar small; M2 smaller than M1; two labial re-entrant folds of equal length on M3; anterior cingulum of M1 small; frontal region moderately swollen.

Meadow jumping mice are most common in moist, grassy areas, often near a stream. They swim well, even under water. They eat seeds, roots, berries, and insects, and leave characteristic piles of cut grass (pieces are 2–4 inches in length) at their feeding sites. In autumn they become fat and hibernate below ground during winter. They usually have one litter a year, numbering 2 to 8, born in early summer, but a second litter may be customary for some subspecies.

KEY TO SPECIES OF ZAPUS AND NAPAEOZAPUS

(*Zapus*-part after Krutzsch, 1954:384)

1. Fourth upper premolar absent (3 cheek-teeth present); tip of tail white. . . *Napaeozapus insignis*, p. 778
1′. Fourth upper premolar present (4 cheek-teeth present); tip of tail not white.
2. Baculum with tip spade-shaped and tip wider than 0.43; underfur with medullary pattern rectangular, cuticular scales small; coronoid process of mandible long and slender, angle of divergence from condyle broad; angle of mandible turned in and wide; pterygoid fossae wide; skull broad in relation to length; premolars with crescentine fold on occlusal surface. . . . *Zapus trinotatus*, p. 776
2′. Baculum with tip lanceolate (not spade-shaped) and tip less than 0.43 wide; underfur with medullary pattern square or rectangular; but, if rectangular, cuticular scales large; coronoid process short and broad, angle of divergence from condyle narrow; angle of mandible turned inward and small to medium; pterygoid fossae usually narrow; skull not broad in relation to length; premolars without crescentine fold on occlusal surface.
3. Baculum less than 5.1 in total length; guard hair averaging 115u in diameter (range, 96–140); medullary pattern of underfur rectangular and its cuticular scales large; skull small; incisive foramina shorter than 4.6; condylobasal length averaging less than 20; length of maxillary tooth-row averaging less than 3.7; palatal breadth at M3 less than 4.2. . . . *Zapus hudsonius*, p. 771
3′. Baculum more than 5.1 in total length; guard hair more than 140u in diameter (range, 130–168); medullary pattern of underfur squarish and its cuticular scales moderately large; skull large; incisive foramina longer than 4.7; condylobasal length more than 21; maxillary tooth-row averaging more than 3.8; palatal breadth at M3 more than 4.4. . . . . *Zapus princeps*, p. 774

Zapus hudsonius

Meadow Jumping Mouse

External measurements: 188–216; 112–134; 28–31. Back ochraceous to dark brown; sides pale; lateral line ochraceous-buff, indistinct, or absent; belly white or suffused with ochraceous; tail brown to brownish-black above, white to yellowish-white below. Skull narrow in proportion to length; upper premolar small (.30 long and .35 wide), with shallow re-entrant fold; tooth-row short. *Zapus hudsonius* differs from the other species of the genus in smaller size, narrower skull, smaller premolars, and shorter tooth-row.

The meadow jumping mouse occurs most frequently in open, moist areas, or in low undergrowth of grasses and forbs in coniferous or deciduous forests. Embryos in 62 pregnant females averaged

5.4 (2–8) per animal and there may be 2 litters per year.

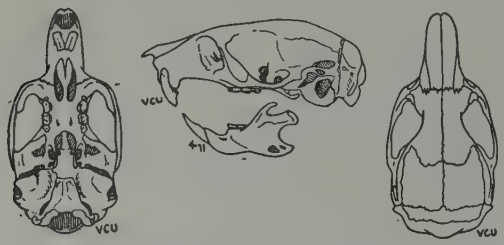
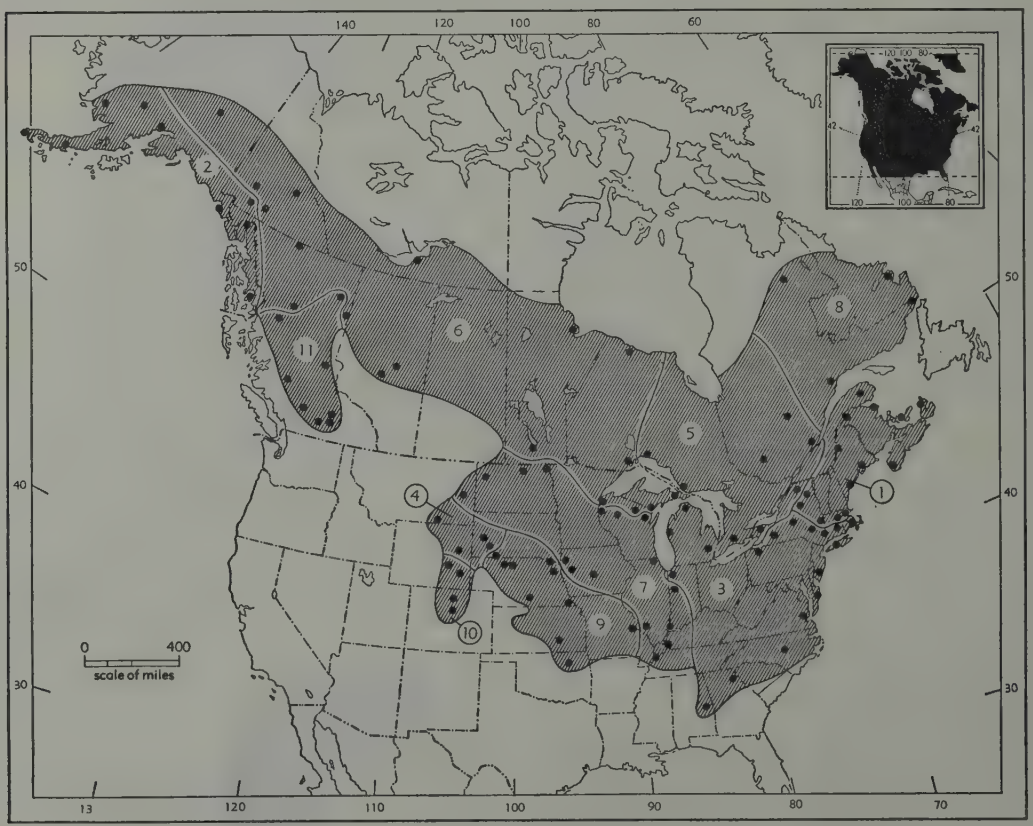


Fig. 427. *Zapus hudsonius campestris*, 3 mi. NW Sundance, Crook Co., Wyoming, No. 20844 K.U., ♀, X 1½.

Zapus hudsonius acadicus (Dawson)

1856. *Meriones acadicus* Dawson, Edinburgh New Philos. Jour., n. s., 3:2. Type from Nova Scotia, Canada.
1942. *Zapus hudsonius acadicus*, Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, p. 38 (for 1941), July 14.
1899. *Zapus hudsonius hardyi* Batchelder, Proc. New England Zool. Club, 1:5, February 8, type from Mount Desert Island, Hancock Co., Maine.

MARGINAL RECORDS (Krutzsch, 1954:435, unless otherwise noted).—Quebec: Ste. Anne des Monts. New Brunswick: Miramichi Road, 15 mi. from Bathurst. Prince Edward Island. Nova Scotia: Big Intervale (R. Smith, 1940: 237); Doctors Cove, N of Barrington Passage. Maine: Columbia Falls; Small Point Beach. Massachusetts: Wilmington; 2 mi. N Gilbertville. New York: Berlin; *Glenville*; North Wood; Keene Valley. Maine: E Branch Penobscot River. New Brunswick: Baker Lake.



Map 428. *Zapus hudsonius*.

Guide to subspecies
1. *Z. h. acadicus*
2. *Z. h. alascensis*
3. *Z. h. americanus*
4. *Z. h. campestris*
5. *Z. h. canadensis*
6. *Z. h. hudsonius*
7. *Z. h. intermedius*
8. *Z. h. ladas*
9. *Z. h. pallidus*
10. *Z. h. preblei*
11. *Z. h. tenellus*

Zapus hudsonius alascensis Merriam

1897. *Zapus hudsonius alascensis* Merriam, Proc. Biol. Soc. Washington, 2:223, July 15, type from Yakutat Bay, Alaska.

MARGINAL RECORDS (Krutzsch, 1954:436).—Alaska: Lake Aleknagik; head Chalitna River. Yukon: SW end Dezadeash Lake, 2400 ft. Alaska: E side Chilkat River, 100 ft., 9 mi. W, 4 mi. N Haines; Portage Cove, Revillagigedo Island; Yakutat; Cook Inlet, Tyonek; Chignik Bay; Frosty Peak.

Zapus hudsonius americanus (Barton)

1799. *Dipus americanus* Barton, Trans. Amer. Philos. Soc., 4:115. Type locality, near Schuykill River, a few miles from Philadelphia, Pennsylvania.
1899. *Zapus hudsonius americanus*, Batchelder, Proc. New England Zool. Club, 1:6, February 8.
1839. *Meriones microcephalus* Harlan, Proc. Zool. Soc. London, p. 1, July. Type locality, Beck's Farm, a few miles NE Philadelphia, Philadelphia Co., Pennsylvania.
1942. *Zapus hudsonius brevipes* Bole and Moulthrop, Sci. Publ. Cleveland Mus. Nat. Hist., 5:168, September 11, type from Bettsville, Seneca Co., Ohio.
1942. *Zapus hudsonius rafinesquei* Bole and Moulthrop, Sci. Publ. Cleveland Mus. Nat. Hist., 5:169, September 11, type from Cat Run, Bellmont Co., Ohio.

MARGINAL RECORDS (Krutzsch, 1954:440–441, unless otherwise noted).—Michigan: Douglas Lake; Bloomfield. Pennsylvania: *East Springfield; 4½ mi. SW* [town of] *North East*; Bensons Swamp, 5 mi. E Columbus. New York: E Aurora; Peterboro; Catskills. Connecticut: Sharon; South Woodstock. Massachusetts: Middleboro. New York: Locust Grove. New Jersey: Tuckerton. Maryland: Assateagus, 5 mi. S Ocean City. Virginia: near Hampton. North Carolina: Raleigh. Georgia: Athens. Alabama: 4 mi. N Auburn (Sullivan, 1954:592, as *Zapus hudsonius*). Indiana: Mineral Springs. Michigan: 9 mi. N Ludington.

Zapus hudsonius campestris Preble

1899. *Zapus hudsonius campestris* Preble, N. Amer. Fauna, 15:20, August 8, type from Bear Lodge Mts., Crook Co., Wyoming.

MARGINAL RECORDS (Krutzsch, 1954:442).—Montana: Rotten Grass Creek, N base Big Horn Mts. South Dakota: Nelsons Place, 3 mi. SE Hill City; Wind Cave National Park Game Ranch, Cold Spring Creek. Wyoming: 1½ mi. E Buckhorn, 6150 ft.

Zapus hudsonius canadensis (Davies)

1798. *Dipus canadensis* Davies, Trans. Linn. Soc. London, 4:157. Type locality, near city of Quebec, Canada.
1899. *Zapus hudsonius canadensis*, Batchelder, Proc. New England Zool. Club, 1:4, February 8.
1943. *Zapus hudsonius ontarioensis* Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, p. 59 (for 1942), type from Pancake Bay (Batchawana Bay) southeast end of Lake Superior, Algoma Dist., about 40 mi. NE Sault Ste. Marie, Ontario.

MARGINAL RECORDS (Krutzsch, 1954:443).—Quebec: ¾ mi. N Mistassini Post; Valcartier. New York: Spectacle Pond, Brighton Township; Elba. Ontario: St. Thomas; Pancake Bay; Schreiber. Quebec: Kiamika Lake.

Zapus hudsonius hudsonius (Zimmermann)

1780. *Dipus hudsonius* Zimmermann, Geographische Geschichte . . . , 2:358. Type locality, Hudson Bay, Canada (considered by Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, p. 37 (for 1941), July 14, 1942, to be Fort Severn, Ontario).
1876. *Zapus hudsonius*, Coues, Bull. U. S. Geol. and Geogr. Surv. Territories, ser. 2, 1:253, January 8.
1792. *Dipus labradorius* Kerr, The animal kingdom . . . , p. 276, based on "Labradore Jerboid Rat" of Pennant's History of Quadrupeds, 1781.

MARGINAL RECORDS (Krutzsch, 1954:447, unless otherwise noted).—Alaska: Fairbanks. Yukon: forks of MacMillan River. Mackenzie: Fort Resolution. Manitoba: York Factory. Ontario: Fort Severn; Silver Islet. Michigan: Marquette National Forest; 5 mi. N Menominee. Wisconsin: Crandon; Solon Springs. Manitoba: Delta. Alberta: 30 mi. above Athabasca Landing, Athabasca River; Lac la None. British Columbia: Charlie Lake (Cowan and Guiguet, 1956: 241); Driftwood (*ibid.*); 1 mi. NW junction of Irons Creek and Liard River. Yukon: McIntyre Creek, 2250 ft., 3 mi. NW Whitehorse; Lake Lebarge.

Zapus hudsonius intermedius Krutzsch

1954. *Zapus hudsonius intermedius* Krutzsch, Univ. Kansas Publ., Mus. Nat. Hist., 7:447, April 21, type from Ridgeway, Winneshiek Co., Iowa.

MARGINAL RECORDS (Krutzsch, 1954:449, unless otherwise noted).—North Dakota: Fish Lake; Pembina. Wisconsin: Danbury; Ogema; Lakewood. Illinois: Fox Lake. Indiana: La Fayette; New Harmony. Kentucky: Lyon County. Tennessee: ½ mi. ESE Lasiter's Corner (on geographical grounds from Goodpaster and Hoffmeister, 1952: 370). Illinois: 6 mi. S Pinckneyville (near Pyatt). Iowa: Ames; Arthur; Ireton. Montana: Yellowstone River, 7 mi. NE Glendive, 2000 ft. North Dakota: Grinnell.

Zapus hudsonius ladas Bangs

1899. *Zapus hudsonius ladas* Bangs, Proc. New England Zool. Club, 1:10, February 28, type from Rigoulette, Hamilton Inlet, Labrador.

MARGINAL RECORDS (Krutzsch, 1954:450).—Quebec: northwest Ungava. Labrador: Makkovik; Red Bay. Quebec: Trout Lake, near Moise Bay.

Zapus hudsonius pallidus Cockrum and Baker

1950. *Zapus hudsonius pallidus* Cockrum and Baker, Proc. Biol. Soc. Washington, 63:1, April 26, type from NW corner sec. 4, T. 12S, R. 20E, 5½ mi. N, 1¾ mi. E Lawrence, Douglas Co., Kansas.

MARGINAL RECORDS (Krutzsch, 1954:452).—South Dakota: Batesland. Nebraska: 3 mi. NE Ponca; Beemer; 5 mi. SE Rulo. Missouri: Pevely. Oklahoma: Mohawk Park. Kansas: ½ mi. S Hamilton. Nebraska: Platte Meadows, Kearney; Ballard Marsh, 20 mi. S Valentine; Niobrara River, 18 mi. NW Kennedy.

Zapus hudsonius preblei Krutzsch

1954. *Zapus hudsonius preblei* Krutzsch, Univ. Kansas Pub., Mus. Nat. Hist., 7:452, April 21, type from Loveland, Larimer Co., Colorado.

MARGINAL RECORDS (Krutzsch, 1954:453).—Wyoming: Springhill, 12 mi. N Laramie Peak, 6300 ft.; Chugwater; *Cheyenne*. Colorado: type locality; *5 mi. E Boulder*; Semper; *3 mi. E Boulder*.

Zapus hudsonius tenellus Merriam

1897. *Zapus tenellus* Merriam, Proc. Biol. Soc. Washington, 11:103, April 26, type from Kamloops, British Columbia.
1934. *Zapus hudsonius tenellus*, Hall, Univ. California Publ. Zool., 40:377, November 5.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:241, unless otherwise noted): E side Minaker River, 1 mi. W Trutch (Krutzsch, 1954:454); 5 mi. W, 3 mi. N Fort St. John (*ibid.*); Indianpoint Lake; Enderby; Coldstream near Vernon; Hazelton (Krutzsch, 1954:454, but Cowan and Guiguet, 1956:244, without stating their reasons, refer specimens from Hazelton, and also from 1 mi. W Trutch, to the subspecies *hudsonius*).

Zapus princeps
Western Jumping Mouse

External measurements: 216–247; 129–148; 31–34. Back yellowish-gray to salmon-brown and ochraceous; sides paler than back; lateral line ochraceous-buff or indistinct or absent; belly white, usually suffused with ochraceous; tail pale brown to grayish brown above, white to yellowish white below. Skull large; upper premolars medium (.55 long and .50 wide), with shallow re-entrant fold. *Zapus princeps* differs from *Z. trinotatus* in having smaller premolars, a narrower and shallower skull, and a shorter baculum; from *Z. hudsonius*, *Z. princeps* differs in having larger premolars, a longer rostrum, and a longer baculum.

The western jumping mouse lives in the Canadian and Transition life-zones near streams where grasses and herbs are abundant. There is probably only one litter a year. In 25 pregnant females the number of embryos averaged 5 (2–7).

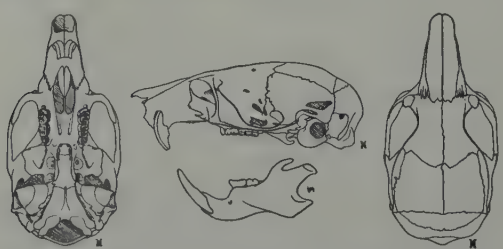


Fig. 428. *Zapus princeps oregonus*, Wisconsin Creek, 7800 ft., Nevada, No. 45871 M.V.Z., ♂, X 1¼.

Zapus princeps cinereus Hall

1931. *Zapus princeps cinereus* Hall, Univ. California Publ. Zool., 37:7, April 10, type from Pine Canyon, 6600 ft., Raft River Mts., 17 mi. NW Kelton, Boxelder Co., Utah.

MARGINAL RECORDS (Krutzsch, 1954:400).—Idaho: Camp Tendoy, Pocatello. Utah: Pine Creek, 3 mi. N Rosette, Raft River Mts., 6100 ft. Idaho: Mt. Harrison, 10 mi. S Albion.

Zapus princeps curtatus Hall

1931. *Zapus princeps curtatus* Hall, Univ. California Publ. Zool., 37:7, April 10, type from head of Big Creek, 8000 ft., Pine Forest Mts., Humboldt Co., Nevada.

MARGINAL RECORDS (Krutzsch, 1954:401).—Nevada: Alder Creek, 6000 ft.; *type locality*; Leonard Creek, 6500 ft.

Zapus princeps idahoensis Davis

1934. *Zapus princeps idahoensis* Davis, Jour. Mamm., 15: 221, August 10, type from 5 mi. E Warm Lake, 7000 ft., Valley Co., Idaho.

MARGINAL RECORDS (Krutzsch, 1954:404, unless otherwise noted).—Alberta: Boom Creek, 5600 ft., 27 mi. W Banff; *Crows Nest Pass; Waterton Lakes Park*. Montana: Highwood Mts.; 15 mi. S Heath, N Fork Flat Willow Creek; 2 mi. E Shriver, 6500 ft. Wyoming: 12 mi. W Wapiti; 23½ mi. S and 5½ mi. W Lander, 8600 ft.; 19 mi. W, 2 mi. S Big Piney, 7700 ft. Idaho: 7 mi. W West Yellowstone, 7000 ft.; 17 mi. E, 4 mi. N Ashton, 6275 ft.; Prairie Creek, 12 mi. NW Ketchum, 2400 ft.; 5 mi. W Warm Lake, 7000 feet; 1 mi. N Bear Creek R. S., SW slope Smith Mtn., 5400 ft.; N Fork Potlatch River. Washington: Kamiak Butte (Dalquest, 1948:373). Idaho: 13 mi. E, 5 mi. N Coeur d'Alene. British Columbia: Newgate; Vermilion Crossing, Kootenay.

Zapus princeps kootenayensis Anderson

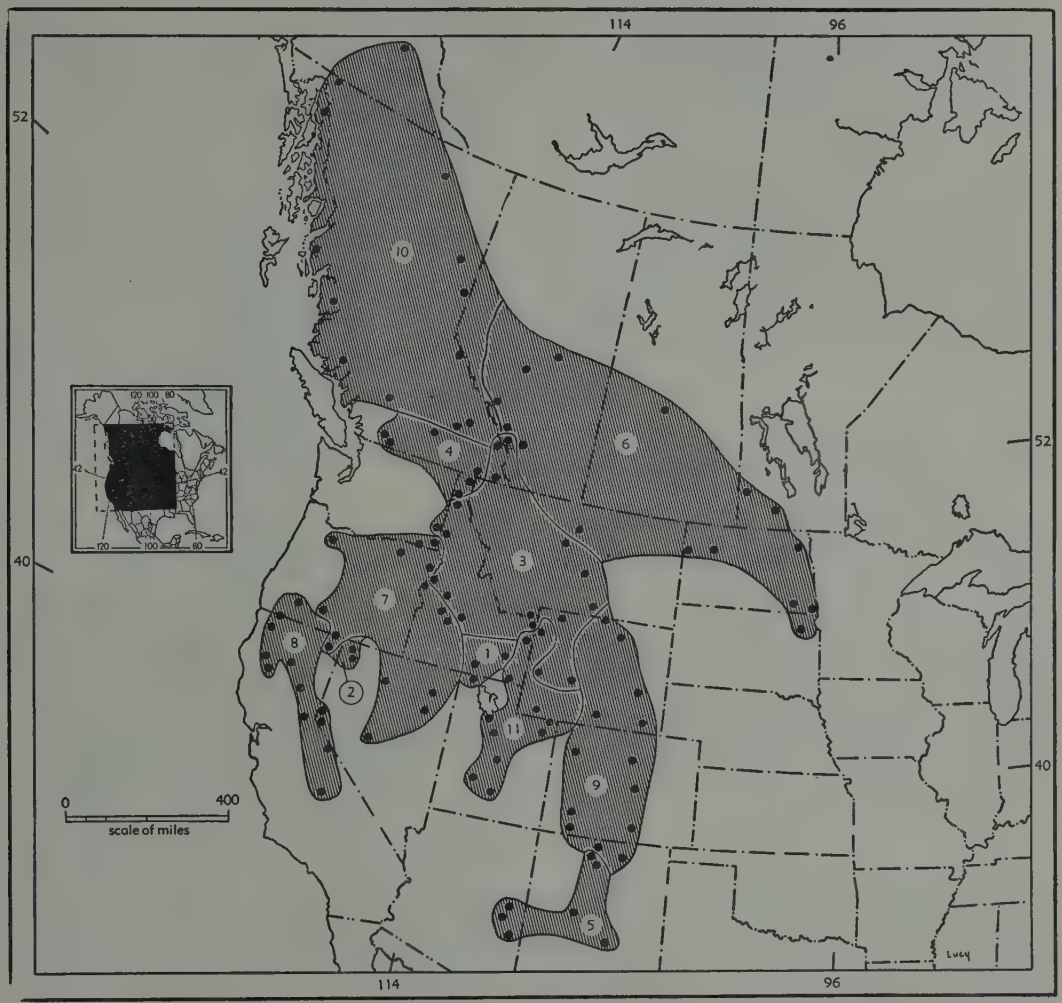
1932. *Zapus princeps kootenayensis* Anderson, Ann. Rept. Nat. Mus. Canada, for 1931, p. 108, November 24, type from near summit Green Mtn., head Murphy Creek, about 10 mi. N Rossland, West Kootenay Dist., British Columbia.

MARGINAL RECORDS (Krutzsch, 1954:406, unless otherwise noted).—British Columbia: Monashee Pass, 4000 ft.; Moyie (Cowan and Guiguet, 1956:244); *Camp 6, Meadow Creek, 7 mi. SE Yahk*. Idaho: 4 mi. W Meadow Creek, 3000 ft.; 5 mi. W Cocololla, 3500 ft. Washington: *Sullivan Lake* (Dalquest, 1948:373). British Columbia: Manning Park; Hope-Princeton Summit, 5500 ft.

Zapus princeps luteus Miller

1911. *Zapus luteus* Miller, Proc. Biol. Soc. Washington, 24: 253, December 23, type from Espanola, 5000 ft., Rio Arriba Co., New Mexico.
1954. *Zapus princeps luteus*, Krutzsch, Univ. Kansas Publ., Mus. Nat. Hist., 7:406, April 21.
1913. *Zapus luteus australis* Bailey, Proc. Biol. Soc. Washington, 26:132, May 21, type from Socorro, Socorro Co., New Mexico.

MARGINAL RECORDS (Krutzsch, 1954:407).—New Mexico: 4 mi. N El Rito, 7000 ft.; type locality; 12 mi.



Map 429. *Zapus princeps.*

Guide to subspecies
1. Z. *p. cinereus*
2. Z. *p. curtatus*
3. Z. *p. idahoensis*
4. Z. *p. kootenayensis*
5. Z. *p. luteus*
6. Z. *p. minor*
7. Z. *p. oregonus*
8. Z. *p. pacificus*
9. Z. *p. princeps*
10. Z. *p. saltator*
11. Z. *p. utahensis*

E Cloudcroft, 7500 ft. Arizona: Hannagan Creek, 8200 ft.; W Fork Black River, 7700 ft.; N Fork White River, White Mts. New Mexico: Socorro.

Zapus princeps minor Preble

1899. *Zapus princeps minor* Preble, N. Amer. Fauna, 15:23, August 8, type from Wingard, near Carleton House, Saskatchewan.

MARGINAL RECORDS (Krutzsch, 1954:409).—Alberta: 4 mi. N Marinville [= Morinville]. Saskatchewan: type locality. Manitoba: Shoal Lake; Aweme. North Dakota: Grafton; 4 mi. S Blackner. South Dakota: Webster. North Dakota: Oakes; Grinnell; Buford. Montana: Eagle Creek, 25 mi. SE Big Sandy. Alberta: High River; Kananaskis Valley, 2000 ft.; Red Deer River; Blindman River.

Zapus princeps oregonus Preble

1899. *Zapus princeps oregonus* Preble, N. Amer. Fauna, 15: 24, August 8, type from Elgin, Blue Mts., Union Co., Oregon.

1899. *Zapus major* Preble, N. Amer. Fauna, 15:24, August 8, type from Warner Mts., Lake Co., Oregon.
1899. *Zapus nevadensis* Preble, N. Amer. Fauna, 15:25, August 8, type from Ruby Mts., Elko Co., Nevada.
1931. *Zapus princeps palatinus* Hall, Univ. California Publ. Zool., 37:8, April 10, type from Wisconsin Creek, 7800 ft., Toyabe Mts., Nye Co., Nevada.

MARGINAL RECORDS (Krutzsch, 1954:412).—Washington: Anatone, 3300 ft. Oregon: East Pine Creek, 2¾ mi. NE Cornucopia. Idaho: 1 mi. NE Heath, SW slope Cuddy Mtn., 4000 ft.; Bald Mtn., R. S., 10 mi. S Idaho City, 7400 ft.; Trail Creek, Boise National Forest. Nevada: Harrison Pass R. S., Ruby Mts.; Steel Creek, 7000 ft.; Wisconsin Creek, 7000 ft.; 13 mi. N Paradise Valley, 6700 ft. California: Lassen Creek; Buck Creek R. S. Oregon: Fort Klamath; Marks Creek, 12 mi. N Howard; Meacham. Washington: Twin Buttes, 25 mi. SE Dayton.

Zapus princeps pacificus Merriam

1897. *Zapus pacificus* Merriam, Proc. Biol. Soc. Washington, 11:104, April 26, type from Prospect, Rogue River Valley, Jackson Co., Oregon.
1954. *Zapus princeps pacificus*, Krutzsch, Univ. Kansas Publ., Mus. Nat. Hist., 7:412, April 21.
1898. *Zapus alleni* Elliot, Field Columb. Mus., Publ. 27, Zool. Ser., 1:212, April 19, type from Pyramid Peak, Lake Tahoe, Eldorado Co., California.

MARGINAL RECORDS (Krutzsch, 1954:414).—Oregon: type locality. Nevada: ⅛ mi. S Mt. Rose, 9500 ft.; ⅛ *mi. S Marlette Lake, 8150 ft.*; ⅛ mi. E Zephyr Cove, Lake Tahoe, 6400 ft. California: Mono Lake P. O., 6500 ft.; 2 mi. E Kern Peak, 9300 ft., Sierra Nevada Mts.; 1 mi. W Fyffe; Rich Gulch, 3850 ft., 11 mi. W, 8 mi. N Quincy; Warner Creek, 8000 ft., Lassen Peak; 2 mi. S Yolla Bolly Mtn.; 8 mi. NE Hyampon, 2900 ft.; Siskiyou Mts., 6000 ft.; Poker Flat, 5000 ft., 12 mi. NW Happy Camp.

Zapus princeps princeps J. A. Allen

1893. *Zapus princeps* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 5:71, April 28, type from Florida, La Plata Co., Colorado.

MARGINAL RECORDS (Krutzsch, 1954:415–416).—Wyoming: Medicine Wheel Ranch, 9000 ft., 28 mi. E Lovell; 1 mi. W and ⅝ mi. S Buffalo, 4800 ft.; 21 mi. S, 24 mi. W Douglas, 7400 ft.; 5 mi. W, 1 mi. N Horse Creek P. O. Colorado: Gold Hill; Minnehaha; 7 mi. SE Russell. New Mexico: E slope Taos Mts.; Tierra Amarilla. Colorado: type locality; 6½ mi. SW Silverton; Meeker. Wyoming: Bridgers Pass, 18 mi. W Rawlins, 7500 ft.

Zapus princeps saltator J. A. Allen

1899. *Zapus saltator* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 12:3, March 4, type from Telegraph Creek, British Columbia.
1931. *Zapus princeps saltator*, Hall, Univ. California Publ. Zool., 37:10, April 10.

MARGINAL RECORDS (Cowan and Guiguet, 1956:244, unless otherwise noted).—Yukon: Rose River, mile 95 on Canol Road (Krutzsch, 1954:418). British Columbia: mile 114 on Alaska Highway north of Summit Pass; Charlie Lake; Tupper Creek; Moose Pass; Glacier; Mt. Revelstoke (Krutzsch, 1954:418); Lillooet; Knight Inlet; Kynoch Inlet; Inverness. Alaska: Taku River (Krutzsch, 1954:418). British Columbia: Atlin.

Zapus princeps utahensis Hall

1934. *Zapus princeps utahensis* Hall, Occas. Papers Mus. Zool., Univ. Michigan, 296:3, November 2, type from Beaver Creek, 19 mi. S Manila, Daggett Co., Utah.

MARGINAL RECORDS (Krutzsch, 1954:420, unless otherwise noted).—Wyoming: ¼ mi. E Moran, 6700 ft.; 2 mi. E Robertson, 7200 ft. Utah: junction Deep Creek and Carter Creek, 7900 ft.; Paradise Park, 21 mi. W, 15 mi. N Vernal, 10,500 ft.; Ephraim, 8500 ft.; E Fork Boulder Creek, 10 mi. N Boulder (Durrant, *et al.*, 1955:78); Puffer Lake; Payson Lake, 8300 ft., 12 mi. SE Payson, Mt. Nebo; Butterfield Canyon, approximately 5 mi. above Butterfield Tunnel. Idaho: Strawberry Creek, 20 mi. NE Preston, 6700 ft.; 3 mi. SW Victor.

Zapus trinotatus
Pacific Jumping Mouse

External measurements: 221–238; 131–149; 31–34. Back of various shades of ochraceous and tawny; sides paler than back; lateral line distinct and bright; belly white, usually suffused with ochraceous; ears dark; tail brown above, white to yellowish-white below. Skull broad and deep in proportion to length; upper premolars large (.70 long and .75 wide), with labial re-entrant fold forming crescentice loop. *Zapus trinotatus* differs from *Z. princeps* and *Z. hudsonius* in having larger premolars, a broader skull, and a longer baculum.

The Pacific jumping mouse inhabits moist, grassy areas or wooded areas with an understory of ferns and weeds, mostly west of the crest of the Cascade-Sierra Nevada Mountain Chain. Normally there is but one litter of 4–8 young per year. At birth the young are altricial, not even having visible vibrissae.

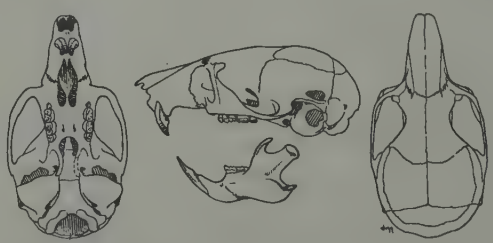


Fig. 429. *Zapus trinotatus montanus*, E slope Cascade Divide, 6400 ft., Crater Lake National Park, Oregon, No. 22165 K.U., ♀, X 1⅛.

Map 430. *Zapus trinotatus.*

1. *Z. t. eureka*
2. *Z. t. montanus*
3. *Z. t. orarius*
4. *Z. t. trinotatus*

Zapus trinotatus eureka A. B. Howell

1920. *Zapus trinotatus eureka* A. B. Howell, Univ. California Publ. Zool., 21:229, May 20, type from Fair Oaks, Humboldt Co., California.

MARGINAL RECORDS (Krutzsch, 1954:390).—California: Trinidad; Russian Gulch State Park; Albion River, ¾ mi. E MacDonalds Ranch; Mendocino City; Carlotta.

Zapus trinotatus montanus Merriam

1897. *Zapus trinotatus montanus* Merriam, Proc. Biol. Soc. Washington, 11:104, April 26, type from Crater Lake, Klamath Co., Oregon.

MARGINAL RECORDS (Krutzsch, 1954:391).—Oregon: Brooks Meadow, 4300 ft., 9 mi. ENE Mt. Hood; Tumalo Creek, 15 mi. W Bend, 6100 ft.; Anna Creek, Mt. Mazama, 6000 ft.; east slope Cascade Divide, 6400 ft., Crater Lake National Park; Diamond Lake; North Santiam River, 3400 ft. (Sight record by Roest (1951:346) from Oregon Caves National Monument is referred, on geographic grounds, to *Z. princeps pacificus.*)

Zapus trinotatus orarius Preble

1899. *Zapus orarius* Preble, N. Amer. Fauna, 15:29, August 8, type from Point Reyes, Marin Co., California.
1944. *Zapus trinotatus orarius*, Hooper, Miscl. Publ. Mus. Zool., Univ. Michigan, 59:67, January 12.

MARGINAL RECORDS (Krutzsch, 1954:392).—California: 3 mi. W Inverness, 300 ft.; West Portal, Fort Barry.

Zapus trinotatus trinotatus Rhoads

1895. *Zapus trinotatus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 47:421, January 15, type from Lulu Island, mouth of Frazer River, British Columbia.
1899. *Zapus imperator* Elliot, Field Columb. Mus., Publ. 30, Zool. Ser., 1:228, February 2, type from Siegs Ranch, Elwah River, Clallam Co., Washington.

MARGINAL RECORDS (Krutzsch, 1954:394, unless otherwise noted).—British Columbia: Alta Lake, 2600 ft.; Okanagan; Manning Park. Washington: Baker Lake; Snoqualmie Pass; Mt. Rainier; Ice Caves, 2800 ft., 5 mi. WSW Gulch. Oregon: Portland, Council Crest, 950 ft. California: Requa; Crescent City. Oregon: Gold Beach; Gardiner; Sutton Lake, 6 mi. N Florence; Newport; Netarts; Old Fort Clatsop, 100 ft. Washington: 3¾ mi. SE Chinook, 10 ft.; Deer Lake, 3800 ft. British Columbia: Stanley Park, Vancouver; *Brackendale* (Cowan and Guiguet, 1956:245).

Genus **Napaeozapus** Preble—Woodland Jumping Mouse

Revised by Preble, N. Amer. Fauna, 15:33–37, August 8, 1899.

1899. *Napaeozapus* Preble, N. Amer. Fauna, 15:33, August 8. Type, *Zapus insignis* Miller.

External measurements: 220–255; 131–160; 29–33. Back with a broad band of brown, much darkened with black; sides buff-yellow, tinged with clay color; underparts white, bordered by yellow lateral line; tail sharply bicolor, brown above, lighter below; tip of tail normally white. Premolars absent; M2 about same size as M1; 3 narrow labial reentrant folds of unequal length on M3; anterior cingulum of M1 large; frontal region somewhat swollen.

Woodland jumping mice live in moist areas beneath trees and undergrowth, hibernate, eat fruits, seeds, buds, and invertebrates, breed in spring, have 4 (3–6) young in June, and may have a second litter in September.

Napaeozapus insignis
Woodland Jumping Mouse

See account of the genus.

Napaeozapus insignis abietorum (Preble)

1899. *Zapus* (*Napaeozapus*) *insignis abietorum* Preble, N. Amer. Fauna, 15:36, August 8, type from Peninsula Harbor, N shore Lake Superior, Ontario.

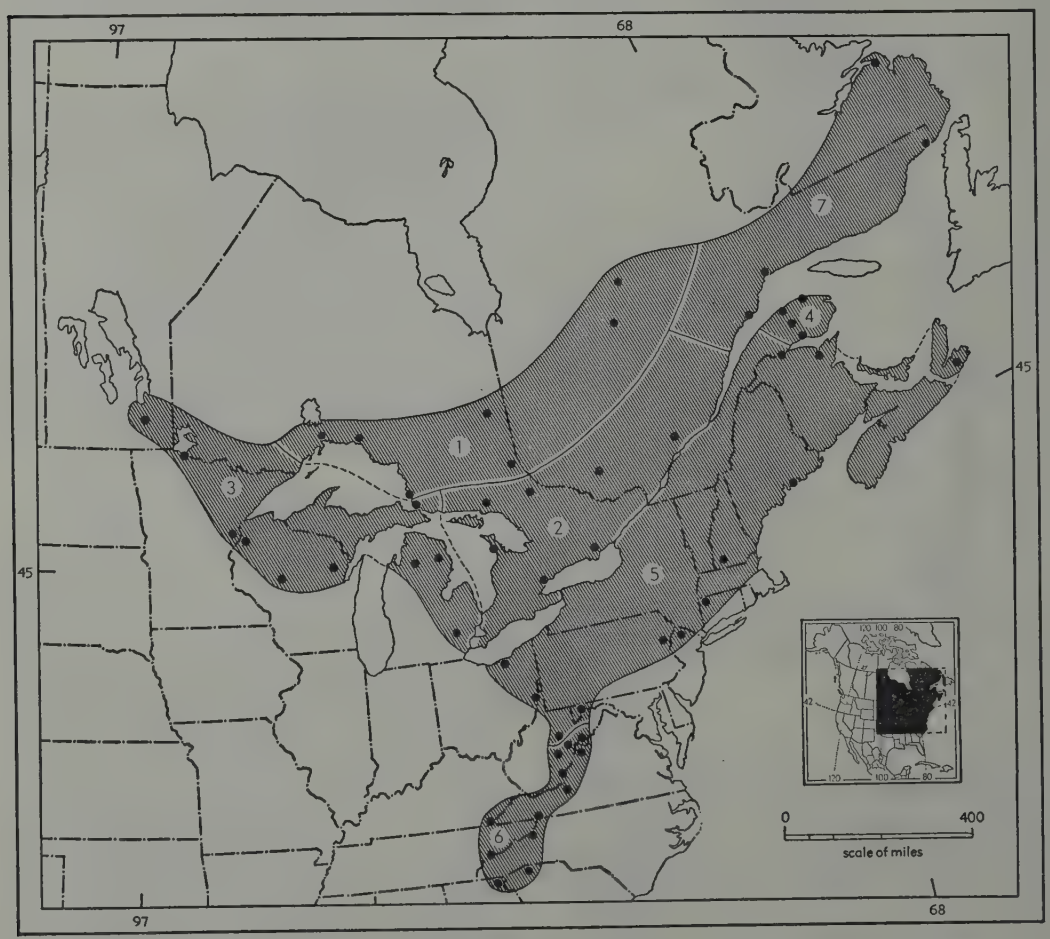
1900. *Napaeozapus insignis abietorum*, Miller, Bull. New York State Mus. Nat. Hist., 8:114, November 21.

MARGINAL RECORDS.—Quebec: Lake Albanel (Cameron and Morris, 1951:120); Mistassini Post (*ibid.*). Ontario: Timagimi Forest Reserve (Anderson, 1947: 171); Pancake Bay (Cameron and Morris, 1951:129); type locality; Nipigon (Anderson, 1947:171); Abitibi (*ibid.*).

Napaeozapus insignis algonquinensis Prince

1941. *Napaeozapus insignis algonquinensis* Prince, Occas. Papers Roy. Ontario Mus. Zool., 7:1, December 12, type from Smoke Lake, Algonquin Park, Ontario.

MARGINAL RECORDS.—Quebec: Lake Edward (Anderson, 1942:39). Ontario: Buckshot (Prince, 1941:3); Credit Forks (*op. cit.*:2); Red Bay, Bruce Peninsula (*ibid.*); Bigwood (Anderson, 1942:38); North Bay (Preble, 1899: 35, on geographical grounds). Quebec: Kazubazua (Prince, 1941:3).



Map 431. *Napaeozapus insignis.*

Guide to subspecies
1. *N. i. abietorum*
2. *N. i. algonquinensis*
3. *N. i. frutectans*
4. *N. i. gaspensis*
5. *N. i. insignis*
6. *N. i. roanensis*
7. *N. i. saguenayensis*

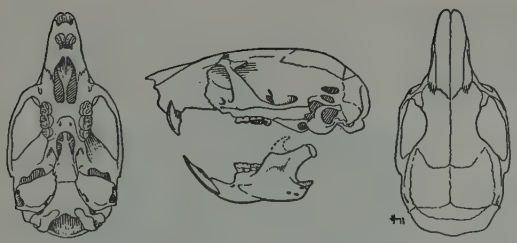


Fig. 430. *Napaeozapus insignis insignis*, 6½ mi. NE Amherst, 600 ft., Franklin Co., Massachusetts, No. 41109 K.U., ♂, X 1¼.

Napaeozapus insignis frutectans Jackson

1919. *Napaeozapus insignis frutectans* Jackson, Proc. Biol. Soc. Washington, 32:9, February 14, type from Crescent Lake, Oneida Co., Wisconsin.

MARGINAL RECORDS.—Manitoba: Cedar Lake, near Vivian (Anderson, 1947:172). Ontario: Batchawana Bay (*ibid.*). Michigan: Alcona County (Burt, 1946:236); Oakland County (*ibid.*); Crawford County (*ibid.*). Wisconsin: Kelley Lake (Jackson, 1919:10); Black River, 2 mi. W Withee (*op. cit.*:10); Danbury (232072 USBS). Minnesota: near Cloverdale (Beer, 1953:385). Ontario: Rainy River (Anderson, 1947:172).

Napaeozapus insignis gaspensis Anderson

1942. *Napaeozapus insignis gaspensis* Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, for 1941, p. 39, July 14, type from near Federal Zinc and Lead Mine, about 1500 ft., on upper waters Berry Mtn. Brook, a tributary of Grand Cascepedia River, Shickshock Mts., about halfway between Gulf of St. Lawrence and Baie de Chaleur, Gaspé Co., Quebec.

MARGINAL RECORDS (Anderson, 1942:40).—Quebec: S shore Gulf of St. Lawrence; Cascapedia Valley; type locality; Ste. Anne des Monts.

Napaeozapus insignis insignis (Miller)

1891. *Zapus insignis* Miller, Amer. Nat., 25:742, August, type from Restigouche River, New Brunswick.
1899. *Napaeozapus insignis*, Miller, Bull. New York State Mus. Nat. Hist., 6:330, November 18.

MARGINAL RECORDS.—New Brunswick: type locality; Gloucester County [= 15 mi. from Bathurst] (Anderson, 1947:171). Nova Scotia: Cape Breton Island (*ibid.*); *all of Nova Scotia* (Smith, 1940:237). Maine: Sieur de Monts Spring, Mount Desert Island (Manville, 1942:396). New Hampshire: Dublin (Preble, 1899:35). Connecticut: Litchfield County (Goodwin, 1932:37). New Jersey: Lake Hopatcong (Preble, 1899:35). Pennsylvania: Mt. Pocono (*ibid.*). Maryland: Frinzel (6 mi. N Frostburg) (*ibid.*). West Virginia: French Creek (Kellogg, 1937:470). Ohio: Cat Run (Bole and Moulthrop, 1942:173); North Chagrin Metropolitan Park (*ibid.*), thence northeastward along south shores of Lake Ontario and Lake Erie and the St. Lawrence River to point of beginning.

Napaeozapus insignis roanensis (Preble)

1899. *Zapus* (*Napaeozapus*) *insignis roanensis* Preble, N. Amer. Fauna, 15:35, August 8, type from Roan Mountain, Mitchell Co., North Carolina.
1900. *Napaeozapus insignis roanensis*, Miller, Bull. New York State Mus. Nat. Hist., 8:114, November 21.

MARGINAL RECORDS.—West Virginia: Spruce Knob (Kellogg, 1937:471). Virginia: Highland County (Handley and Patton, 1947:184); Mountain Lake (*ibid.*); Mt. Rogers (USNM 123369). North Carolina: type locality. South Carolina: Caesar's Head, 3000 ft. (Coleman, 1940:95). Georgia: Rabun County (Odum, 1949:191). Tennessee: Indian Gap, 5200 ft. (Kellogg, 1939:289). Kentucky: N side Big Black Mtn. (Barbour, 1951:109). West Virginia: White Sulphur Springs (Kellogg, 1937:471); Cranberry Glades, 3300 ft. (*ibid.*); Turkeybone Mtn., 2 mi. SSW Pickens (*ibid.*).

Napaeozapus insignis saguenayensis Anderson

1942. *Napaeozapus insignis saguenayensis* Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, for 1941, p. 40, July 14, type from Trout Lake, near Moisie Bay, north shore of Gulf of St. Lawrence, Saguenay Co., Quebec.

MARGINAL RECORDS (Anderson, 1942:41, unless otherwise noted).—Labrador: Hamilton Inlet (Anderson, 1947:172). Quebec: Strait of Belle Isle; type locality; Godbout.

SUBORDER HYSTRICOMORPHA

This suborder includes a diverse assemblage of rodents principally of South American distribution and origin. Members of this suborder appeared in South America probably in the Oligocene.

Infraorbital canal greatly enlarged for transmission of part of masseter muscle; superficial lateral masseter does not extend forward on rostrum; angular process of mandible usually arises from side of ramus (exception: Cavioidea); postorbital process usually absent; dental formula, i. $\frac{1}{1}$, c. $\frac{0}{0}$, pm. $\frac{1}{1}$, m. $\frac{3}{3}$; premolars large and usually strongly molariform; molariform teeth flat-crowned, hypsodont, sometimes persistently growing, and of highly variable pattern; tibia and fibula never fully fused; tendency toward zygomatic complexity.

In attempting to diagnose or prepare a key to the groups of this suborder, one must be constantly aware of the limitations of our present knowledge. Many fossil genera are of uncertain position. The same is true of a number of modern genera. Therefore the composition of the higher categories are highly tentative. The following keys, then, are admittedly less useful than could be hoped.

KEY TO NORTH AMERICAN FAMILIES OF HYSTRICOMORPHA

1. M3 greatly enlarged, exceeding in alveolar length combined length of other upper molariform teeth; molariform teeth strongly prismatic and multilaminar. . . . . Hydrochaeridae, p. 785
1′. M3 not greatly enlarged; molariform teeth not strongly prismatic and, if laminate, not excessively so (fewer than 8 laminae in M3).
2. Upper cheek-teeth laminate, each lamina bearing enamel only on anterior surface; cheek-teeth reduced (apparently) to $\frac{2}{2}$. . . . . Heptaxodontidae, p. 786
2′. Upper cheek-teeth not laminate or, if somewhat laminate, then with enamel not confined to anterior surface of laminae; cheek-teeth more than $\frac{2}{2}$.
3. Inferior border of angular process of mandible strongly inrolled; spiny pelage with conspicuous quills. . . . . Erethizontidae, p. 780
3′. Inferior border of angular process of mandible not strongly inrolled; pelage sometimes spiny but lacking large quills.
4. External form much modified for cursorial life; clavicles reduced or wanting; hind foot functionally tridactyl or, if pentadactyl, then jugal enormously expanded into a broad, curved, externally rugose plate. . . . . Dasyproctidae, p. 787
4′. External form not specially modified for cursorial life; clavicles well developed; hind foot not tridactyl nor is jugal excessively expanded.
5. Paroccipital processes long, relatively straight, and not appressed to auditory bullae. Capromyidae, p. 792
5′. Paroccipital processes long, curved forward under, but not appressed to, auditory bullae. Echimyidae, p. 799

SUPERFAMILY ERETHIZONTOIDEA

FAMILY ERETHIZONTIDAE—New World Porcupines

Form heavy, robust; body covered above with thick, sharp spines distributed among the hairs; molariform teeth flat-crowned, rooted, subhypsodont; lower border of angular process inflected; upper zygomatic root over anterior part of toothrow; feet noticeably modified for arboreal life.

KEY TO NORTH AMERICAN GENERA OF ERETHIZONTIDAE

1. Hallux well developed; tail short, nonprehensile. . . . . *Erethizon*, p. 780
1′. Hallux vestigial or absent; tail long, prehensile. . . . . *Coendou*, p. 783

Genus Erethizon F. Cuvier—Porcupine

Subspecies reviewed by Anderson and Rand, Canadian Jour. Res., sec. D, 21:292–309, September 6, 1943.

1822. *E*[*rethizon*]. F. Cuvier, Mém. Mus. Hist. Nat., Paris, 9:432. Type, *Hystrix dorsata* Linnaeus, 1758.

Size large; body stout; tail short, thick, nonprehensile; 4 digits on forefeet, 5 on hind feet. Skull compact, broad, heavily constructed; nasals broad; frontals broad, heavily ridged, the ridges convergent posteriorly and forming sagittal crest; zygoma uncomplicated, jugal deeper anteriorly; mandible with low coronoid and angular processes; upper cheek-teeth with one persistent internal and one persistent external fold, two additional outer folds tend to become isolated with wear.

The slow-moving, clumsy, and deliberate porcupine can be readily recognized by its large size and investment of quills. The food is vegetable in nature. The cambium layer of certain trees is preferred, but buds, forbs, twigs, and, in season, young evergreen needles are eaten. The porcupine climbs skillfully but deliberately and is sometimes found among the branches of a tree at considerable heights above the ground. The animal is solitary except during the rutting season. Often, however, several animals may be found occupying an unusually favorable den-site.

Because of their diet, porcupines usually occur in timbered areas. But the timber may be of the chaparral type or the spruce forests of the North or anything intermediate. Sometimes this species is found well beyond the limits of the forest if suitable food—willow, for example—is available.

The vocabulary consists of a variety of grunts, coughs, moans, and whines. Vocal demonstrations are usually confined to the mating season.

Normally but one young is born a year. Gestation is about 209 days and the young are born in spring; the month of birth varies with the latitude. Young are born with quills but are usually delivered still enclosed in the foetal membranes.

Although porcupines undoubtedly damage some trees and even kill others, the total destruction, even in local areas, is seldom significant.

The genus is monotypic.

Erethizon dorsatum
Porcupine

External measurements: 648–860; 148–300; 86–124. Upper parts blackish or dark brownish; wooly underfur and long, stiff guard hairs clearly distinct.

Erethizon dorsatum bruneri Swenk

1916. *Erethizon epixanthum bruneri* Swenk, Univ. Nebraska Studies, 16:117, November 21, type from 3 mi. E Mitchell, Scotts Bluff Co., Nebraska.
1947. *Erethizon dorsatum bruneri*, Anderson, Bull. Nat. Mus. Canada, 102:173, January 24.

MARGINAL RECORDS.—Nebraska: type locality. Kansas: 4 mi. S, 1 mi. E Gardner (Cockrum, 1952:217); 6 mi. W Arkansas City (*op. cit.*:219). Oklahoma: Wichita Mts. Wildlife Refuge (McMurry, 1944:413). Texas: Stinnett (Blair, 1954b:254). Oklahoma: E tip of Black Mesa (Glass, 1949:29). Colorado: Geary Reservoir, 9 mi. W Grover (Warren, 1942:244).

Erethizon dorsatum couesi Mearns

1897. *Erethizon epixanthus couesi* Mearns, Proc. U. S. Nat. Mus., 19:723, July 30, type from Fort Whipple, Yavapai Co., Arizona.
1946. *Erethizon dorsatum couesi*, Hall, Mammals of Nevada, p. 649, July 1.

MARGINAL RECORDS.—Utah: head of Nigger Bill Canyon, E side Colorado River, 4 mi. above Moab bridge, 3995 ft. (Durrant, 1952:392). Colorado: Chromo, 8500 ft. (Miller, 1924:134). New Mexico: Santa Fe (Seton, 1932: 168). Texas: La Mota Rancho (Tamsitt, 1954:54, on geographical grounds); The Bowl, 8000 ft. (Davis and Robertson, 1944:271). Sonora: lower flood plain of Río Sonora, close to Gulf of California (Benson, 1953:511); 6 mi. N Puerto Kino (*op. cit.*:512). Arizona: Bill Williams Fork (Mearns, 1897:724). Nevada: about 2¼ mi. NE California–Nevada boundary at tip of state (Pulich, 1953:260); Kyle Canyon, Charleston Peak (Hall, 1946:586); Sheep Mts. (*ibid.*).

Erethizon dorsatum dorsatum (Linnaeus)

1758. [*Hystrix*] *dorsata* Linnaeus, Syst. nat., ed. 10, 1:57. Type locality, eastern Canada.
1822. *E*[*rethizon*]. *dorsatum*, F. Cuvier, Mém. Mus. Hist. Nat., Paris, 9:432.

MARGINAL RECORDS.—Mackenzie: northern part of Anderson River (Anderson, 1937:114); east of Lynx Lake (Banfield, 1951:119). Manitoba: Herchmer (Anderson and Rand, 1943:302). Quebec: Gaspé (Anderson, 1947:172). Nova Scotia: East Roman Valley (Anderson and Rand, 1943: 302); Barrington Passage (*ibid.*), thence along coast to West Virginia: Spruce Knob (Handley and Patton, 1947: 185). Indiana: Franklin County (Lyon, 1936:286). Minnesota: near Elk River (B. Bailey, 1929:163); Warren (Johnson, 1930:447). Alberta: Ray Lake (Soper, 1948:61).

Erethizon dorsatum epixanthum Brandt

1835. *Erethizon epixanthus* Brandt, Mém. Acad. Imp. Sci., St. Pétersbourg, ser. 6, Sci. Math. Phys. et Nat., 3:390. Type locality, California. (See Hollister, Canadian Alpine Jour., Special Number, p. 27, February 17, 1913.)
1884. *Erethrizon* [*sic*] *dorsatus epixanthus*, True, Proc. U. S. Nat. Mus., 7(App., Circ. 29):600, November 29.

MARGINAL RECORDS.—Alberta: Lodge Creek, near W end Cypress Hills (Anderson and Rand, 1943:308). Saskatchewan: Lonesome Butte, SW of Wood Mtn. (*ibid.*). Colorado: South Platte River (Warren, 1942:243). New Mexico: near Cimarron (Hill, 1942:81). Utah (Durrant, 1952:390): Carter Creek; 1 mi. W Kanab, 5000 ft. Nevada: Oak Spring, 6000 ft. (Hall, 1946:585). California: Box Springs, 5300 ft. (Grinnell, 1930:531); vicinity North Yolla Bolly Mtn. (Grinnell, 1933:197); Forest House Mtn., 4000 ft., 8 mi. W Yreka (*op. cit.*:196). Oregon: *"almost the whole State . . . to the*

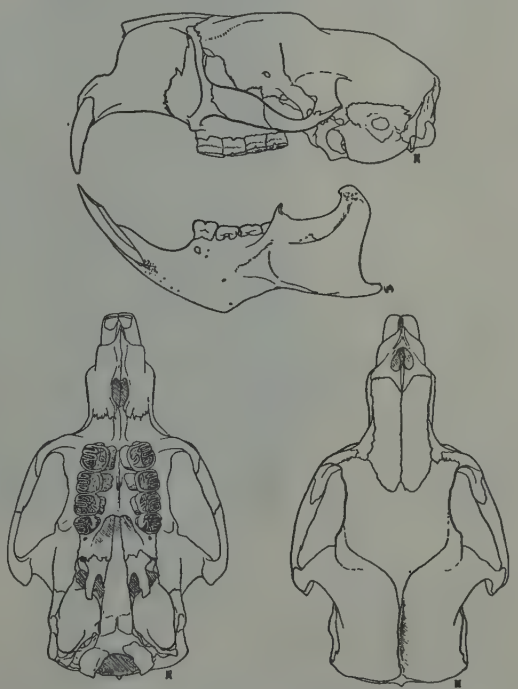


Fig. 431. *Erethizon dorsatum epixanthum*, Wilson Creek, 7200 ft., Nevada, No. 88223 M.V.Z., ♂, X ½.

coast" (V. Bailey, 1936:229). Washington: Walla Walla River, E of Wallula (Dice, 1919:17). Idaho: Coeur d'Alene (Rust, 1946:322).

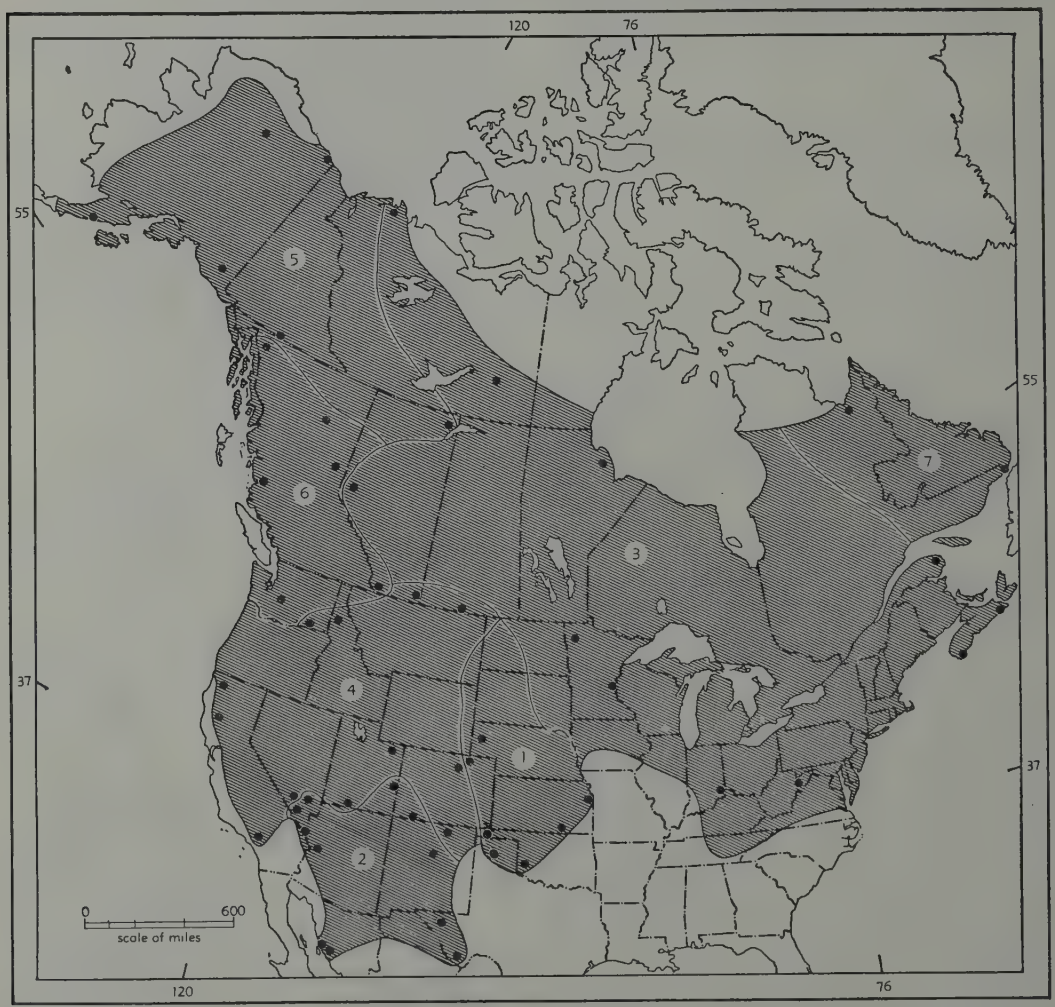
Erethizon dorsatum myops Merriam

1900. *Erethizon epixanthus myops* Merriam, Proc. Washington Acad. Sci., 2:27, March 14, type from Portage Bay, Alaska Peninsula, Alaska.
1943. *Erethizon dorsatum myops*, Anderson and Rand, Canadian Jour. Res., sec. D, 21:293, September 6.

MARGINAL RECORDS.–Alaska: Ice Reef (Anderson, 1937:114). Alberta: Wood Buffalo Park (Anderson, 1947: 173). Yukon: Teslin Lake (Anderson, 1947:173). Alaska: Chitina River (Anderson and Rand, 1943:304); type locality; Chandler Lake (Rausch, 1951:185).

Erethizon dorsatum nigrescens J. A. Allen

1903. *Erethizon epizanthus* [*sic*] *nigrescens* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:558, October 10, type from Shesley River, British Columbia.



Map 432. *Erethizon dorsatum.*

Guide to subspecies
1. *E. d. bruneri*
2. *E. d. couesi*
3. *E. d. dorsatum*
4. *E. d. epixanthum*
5. *E. d. myops*
6. *E. d. nigrescens*
7. *E. d. picinum*

1943. *Erethizon dorsatum nigrescens*, Anderson and Rand, Canadian Jour. Res., sec. D, 21:293, September 6.

MARGINAL RECORDS.—British Columbia: 1 mi. N Atlin (Swarth, 1936:403); Robb Lake (Sheldon, 1932:201); Tupper Creek (Cowan, 1939:87). Alberta: Waterton Lakes (Anderson, 1947:173). Washington: Tye [presumably of this subspecies] (Dalquest, 1948:376). British Columbia: Dean Channel (Anderson and Rand, 1943:306).

Erethizon dorsatum picinum Bangs

1900. *Erethizon dorsatus picinus* Bangs, Proc. New England Zool. Club, 2:37, September 20, type from L'Anse au Loup, Strait of Belle Isle, Labrador.
1937. *Erethizon epixanthum doani* H. H. Bailey, Bailey Mus. and Library Nat. Hist., Bull. 12, p. [1], January 15, type from timber, 15 mi. NW Red Bay, Labrador.

MARGINAL RECORDS.—Quebec: Chimo (Anderson, 1947:174); type locality.

Genus **Coendou** Lacépède—Prehensile-tailed Porcupines

1799. *Coendou* Lacépède, Tableau des divisions, sous-divisions, ordres et genres des mammifères, p. 11. (Published as supplement to Discours d'ouverture et de clôture du cours d'histoire naturelle et tableaux méthodiques des mammifères et des oiseaux.) Type, by subsequent designation (Palmer, N. Amer. Fauna, 23:633, January 23, 1904), *Coendou prehensilis* [probably equals *Hystrix prehensilis* Linnaeus, 1758].
1825?. *Sphiggurus* F. Cuvier, Des dents des mammifères . . . , p. 256. Type, *Sphiggurus spinosus* F. Cuvier. (*Sphiggure* F. Cuvier, Mém. Mus. Hist. Nat., Paris, 9:427, 1822, possibly not intended as a technical name since F. Cuvier formalized the name two years later.)
1825?. *Sinoetherus* F. Cuvier, Des dents des mammifères . . . , p. 256. Type, *Hystrix prehensilis* Linnaeus, 1758. (For *Synéthère* F. Cuvier, 1822, the same remarks as above, pertaining to *Sphiggure*, apply.)
1835. *Cercolabes* Brandt, Mém. Acad. Imp. Sci., St. Pétersbourg, ser. 6, Sci. Math. Phys. et Nat., 3:391, a renaming of *Coendou* Lacépède, 1799. [See also Krumbiegel, Zool. Anz., 137:18–25, January 15, 1942, for discussion of taxonomy and geographic distribution of *Coendou*.]

Skull broad, robust; frontal region much broadened, and strongly arched in dorsal profile; nasals short; palate relatively broad; pterygoid hamulae thick; tympanics well inflated; molariform teeth essentially as in *Erethizon*. Body clothed above with short, thick spines or quills; tail prehensile, modified for contact on distal dorsal surface, quill-bearing above and below proximally; both forefeet and hind feet with 4 digits.

KEY TO NOMINAL NORTH AMERICAN SPECIES OF COENDOU

1. Upper parts "pale fulvous or rufous-yellow, with a slight admixture of brown" (Waterhouse, 1848:434); occurring in West Indies [?]. . . . . *C. pallidus*, p. 784
1′. Upper parts darker; not occurring in the West Indies.
   2. Tips of spines extending well beyond hairs. . . . . *C. rothschildi*, p. 784
   2′. Tips of spines not extending well beyond hairs. . . . . *C. mexicanus*, p. 783

Coendou mexicanus
Mexican Porcupine

Skull moderately (for the genus) inflated and arched in infraorbital region (but varying much in this respect according to subspecies); somewhat elongated and narrow; bullae relatively long and narrow; upper premolar larger than molars. Upper parts blackish to dark brown; underparts grizzled.

Little is known of the habits of the prehensile-tailed porcupines. They are nocturnal, arboreal, and feed on leaves, tender stems, and possibly fruits.

Coendou mexicanus laenatus Thomas

1903. *Coendou laenatus* Thomas, Ann. Mag. Nat. Hist., ser. 7, 11:381, April, type from Boquete, Chiriquí, Panamá.
1920. *Coendou mexicanum laenatum*, Goldman, Smiths. Miscl. Coll., 69(5):133, April 24.

MARGINAL RECORDS.—Costa Rica (Goodwin, 1946: 417): Esparta; Escazú; Pozo Ancho. Panamá: type locality.

Coendou mexicanus mexicanus (Kerr)

1792. *Hystrix mexicana* Kerr, The animal kingdom . . . , 1:214. Type locality, mountains of México [probably in Veracruz, Dalquest, Occas. Papers Mus. Zool., Louisiana State Univ., 23:12, July 10, 1950].

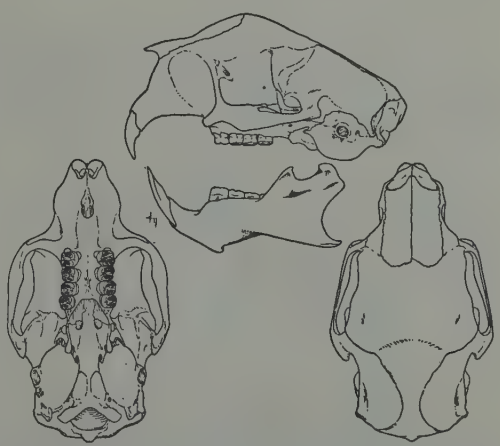


Fig. 432. *Coendou mexicanus mexicanus*, Río Blanco, 20 km. WNW Piedras Negras, Veracruz, No. 18191 K.U., ♀, X ½.

Map 433. *Coendou mexicanus* and *Coendou rothschildi*.

1. *C. mexicanus laenatus*
2. *C. mexicanus mexicanus*
3. *C. mexicanus yucataniae*
4. *C. rothschildi*

1901. *Coendou mexicanum*, Miller and Rehn, Proc. Boston Soc. Nat. Hist., 30(1):173, December 27.
1844. *Cercolabes liebmani* Reinhardt, Arch. Naturgesch., p. 241. Type locality, México.

MARGINAL RECORDS.—San Luis Potosí: above Xilitla at Miramar Grande (Dalquest, 1953b:170). Veracruz: 3 km. E San Andrés Tuxtla, 1000 ft. (24490 KU). Honduras (Goodwin, 1942:173): Guaymaca; Laguna Archaga. Guatemala: Finca Primavera (Goodwin, 1934:60). Veracruz: Río Blanco, 20 km. WNW Piedras Negras, 300 ft. (18190 KU).

Coendou mexicanus yucataniae Thomas

1902. *Coendou mexicanus yucataniae* Thomas, Ann. Mag. Nat. Hist., ser. 7, 10:249, September, type from Yucatán (probably near Izamal).

MARGINAL RECORDS (Gaumer, 1917:135).—Yucatán: Tizimín. Quintana Roo: Nabalam. Yucatán: Izamal. Not found: Yucatán [?]: Kikil; Loché.

Coendou pallidus (Waterhouse)
Pale South American Porcupine

1848. *Cercolabes pallidus* Waterhouse, A natural history of the Mammalia, 2:434, type purported to be from West Indies. Known only by the 2 immature specimens originally described.

1897. [*Coendu*] *pallidus*, Trouessart, Catalogues mammalium . . . , fasc. 3, p. 622.

"General hue of an extremely pale fulvous brown; spines pale sulphur yellow, or white, with a short black point, and almost entirely hidden by the long fur; muzzle dusky brown; feet suffused with brown; tail brown-black beneath" (Waterhouse, 1848:434). Not mapped.

Coendou rothschildi Thomas
Rothschild's Porcupine

1902. *Coendou rothschildi* Thomas, Ann. Mag. Nat. Hist., ser. 7, 10:169, August, type from Sevilla Island, Chiriquí, Panamá.

"Rothschild's porcupine is readily distinguished from its Panama congener, *Coendou mexicanum laenatum*, by the exposed spiny covering, the spines in the latter species being mainly concealed by the long overlapping fur" (Goldman, 1920:134).

MARGINAL RECORDS.—Panamá (Goldman, 1920:135, unless otherwise noted): Gatún; *Barro Colorado Island* (Ingles, 1953:267); *Tabernilla*; type locality; Boquerón.

SUPERFAMILY CAVIOIDEA

FAMILY HYDROCHAERIDAE—Capybaras

Large sized semi-aquatic rodents; M3 greatly enlarged, exceeding in alveolar length the other molariform teeth combined; molariform teeth strongly prismatic, especially M3 which has a series of approximately 10 narrow transverse laminae; paroccipital processes greatly enlarged.

The capybaras are the largest living rodents. They possess partially webbed feet. There is but one known genus, *Hydrochaeris*, extant.

SUBFAMILY HYDROCHAERINAE

Genus Hydrochaeris Brünnich—Capybaras

1772. *Hydrochaeris* Brünnich, Zoologiae Fundamenta . . . , p. 44. Type, *Sus hydrochoeris* Linnaeus, 1766.

Hydrochaeris isthmius Goldman
Panamá Capybara

1912. *Hydrochoerus isthmius* Goldman, Smiths. Miscl. Coll., 60(2):11, September 20, type from Marraganti, near head of tidewater, Río Tuyra, Darién, Panamá.

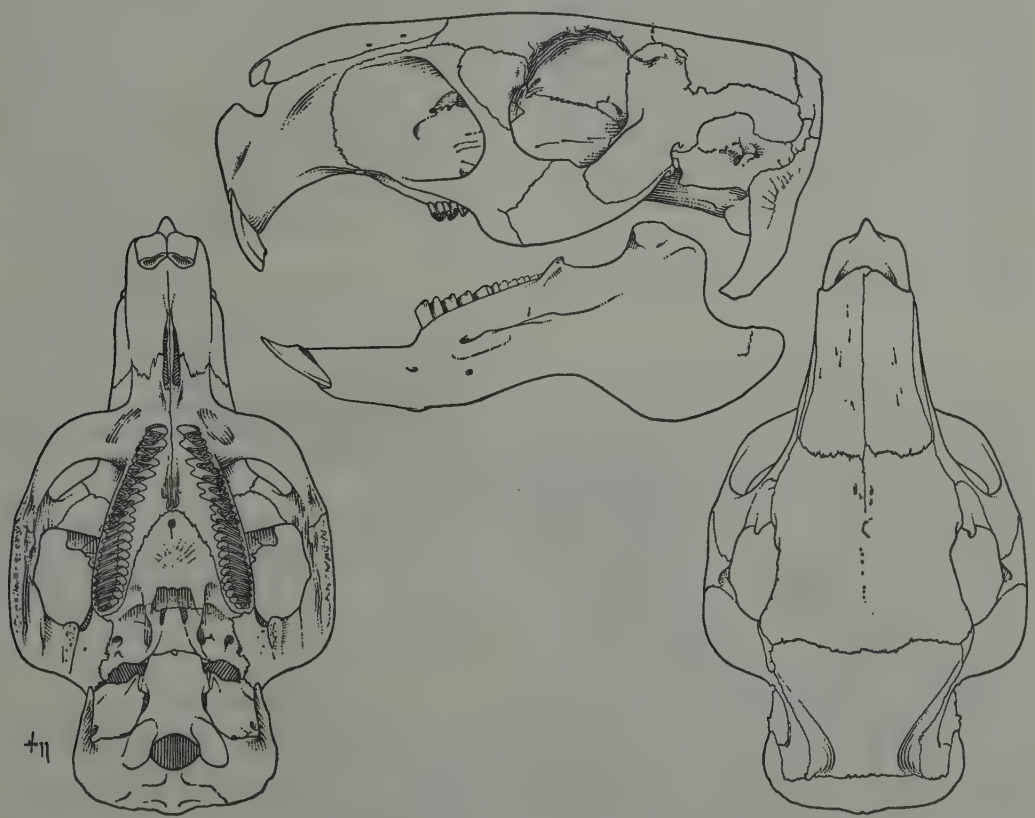
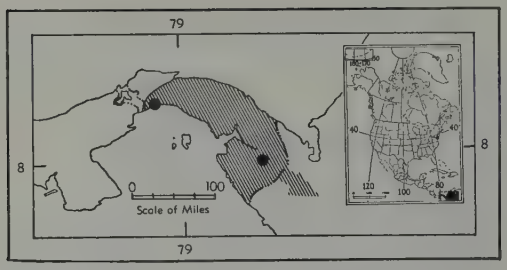


Fig. 433. *Hydrochaeris isthmius*, locality not recorded, No. 38194 A.M., sex ?, X ½.



Map 434. *Hydrochaeris isthmius.*

External measurements of the type, an adult male, are: 1025, 200. Upper parts "varying from very dark rusty reddish to dull pale clay color . . . becoming more or less blackish in some specimens on middle of face, cheeks, lower part of rump, and outer sides of hind legs . . . ears and feet brownish, thinly haired" (Goldman, 1912b:11); underparts slightly paler than upper parts. Skull smaller than that of the South American *H. hydrochoeris* and differing in minor details, especially the shorter, thicker, more rounded pterygoid processes.

Capybaras live in small (family?) groups in the lush vegetation along streams and in swamps. They take to the water readily and swim well. The food consists, so far as known, only of green vegetation. Capybaras are essentially nocturnal in their activity patterns.

MARGINAL RECORDS.—Panamá: *near Juan Mina, Río Chagres Basin* (Trapido, 1947:408); swamps about 15 mi. E Panama City (Trapido, 1949:80); type locality.

FAMILY HEPTAXODONTIDAE

First tooth of maxillary series mechanically dominant; cheek-teeth composed of 4 to 7 vertical laminae the crests of which are approximately parallel and are arranged obliquely to long axis of skull resulting in anterior surface of each lamina of a maxillary tooth facing anteromedially; each lamina bearing enamel on anterior surface only.

Owing to the fragmentary nature of the known remains, it seems inadvisable to attempt to describe this family more precisely. Indeed, there seems to be little agreement among authors as to whether the genera grouped therein do constitute a family comparable to those found in, say, the Myomorpha. The family Heptaxodontidae, so far as is known, is wholly extinct. It is known only by osseous material obtained from cave deposits. Certain genera are included in this work because they may have been extant in the early part of Recent time.

KEY TO NOMINAL GENERA OF HEPTAXODONTIDAE

1. Cheek-teeth reduced to $\frac{2}{2}$. . *Heptaxodon*, p. 786
1′. Cheek-teeth numbering more than $\frac{2}{2}$.
   2. Mandibular symphysis extending posteriorly beyond level of M1. . *Quemisia*, p. 786
   2′. Mandibular symphysis not extending posteriorly beyond level of middle of P4. *Elasmodontomys*, p. 786

SUBFAMILY HEPTAXODONTINAE

Genus Heptaxodon Anthony

1917. *Heptaxodon* Anthony, Bull. Amer. Mus. Nat. Hist., 37:183, January 29. Type, *Heptaxodon bidens* Anthony, 1917.

Seemingly only 2 teeth in each molariform series; palate short, having deep and wide posterior notch reaching nearly to line of first teeth; palate sharply constricted in front by the convergence of the two upper tooth-rows.

So far as known the genus is monotypic and now extinct.

Heptaxodon bidens Anthony

1917. *Heptaxodon bidens* Anthony, Bull. Amer. Mus. Nat. Hist., 37:183, January 29, type from cave deposits near Utuado, Puerto Rico. Known from the type locality and from Ciales, Puerto Rico (Anthony, Mem. Amer. Mus. Nat. Hist., n.s., 2:398, June, 1918). Not mapped.

Genus Elasmodontomys Anthony

1916. *Elasmodontomys* Anthony, Ann. New York Acad. Sci., 27:199, August 9. Type, *Elasmodontomys obliquus* Anthony, 1916.

Cheek-teeth, $\frac{4}{4}$, "the crown patterns of which are made up of five enamel plates and connecting dentine" (Anthony, 1918:380).

Elasmodontomys obliquus Anthony

1916. *Elasmodontomys obliquus* Anthony, Ann. New York Acad. Sci., 27:199, August 9, type from cave deposits near Utuado, Puerto Rico. Known also from Morovis and Ciales, Puerto Rico (Anthony, Mem. Amer. Mus. Nat. Hist., n.s., 2:380, June, 1918). Not mapped.

Genus Quemisia Miller

1929. *Quemisia* Miller, Smiths. Miscl. Coll., 81(9):22, March 30. Type, *Quemisia gravis* Miller, 1929.

Enamel pattern of mandibular cheek-teeth much as in *Elasmodontomys*, but transverse axis of laminae slanting forward at an angle of about 21° in-

stead of about 50°; mandibular symphysis much elongated, extending posteriorly to or beyond level of m1; lower incisors short.

Quemisia gravis Miller

1929. *Quemisia gravis* Miller, Smiths. Miscl. Coll., 81(9): 23, March 30, type from cave near Atalaye Plantation, 4 mi. E St. Michel, Haiti. Known also from Boca de Infierno [cave, Samaná Bay], Dominican Republic (Miller, Smiths. Miscl. Coll., 82(5):10, December 11, 1929). Not mapped.

FAMILY DASYPROCTIDAE—Agoutis and Pacas

Cheek-teeth hypsodont, semi-rooted, having deep re-entrant enamel folds that with wear form isolated narrow lakes; hind feet functionally perissodactylous, forefeet functionally artiodactylous; digits with strong, thick, blunt, almost hooflike claws.

This family contains two relatively diverse groups, the agoutis (*Dasyprocta*) and the pacas (*Agouti*). Some authors (Miller and Gidley, 1918; Ellerman, 1940) place them in separate families principally on the basis of the singular zygomatic structure of the paca.

KEY TO NORTH AMERICAN GENERA OF DASYPROCTIDAE

1. Zygoma much expanded to form broad cheek-plate which is deeply hollowed beneath and, in maturity, extremely rugose above. . . . . *Agouti*, p. 787
1′. Zygoma lacking broad cheek-plate. *Dasyprocta*, p. 788

SUBFAMILY AGOUTINAE

Genus Agouti Lacépède—Pacas

1799. *Agouti* Lacépède, Tableau des divisions, sous-divisions, ordres et genres des mammifères . . . , p. 9. Type by monotypy, *Agouti paca* Lacépède, 1799 [= *Mus paca* Linnaeus, 1758].

1807. *Coelogenus* F. Cuvier, Ann. Mus. Hist. Nat., Paris, 10:203. [*Coelogenys auct.*] Included species, *Coelogenus subniger* F. Cuvier, 1807, and *C. fulvus* F. Cuvier, 1807 [both = *Mus paca* Linnaeus, 1758].

Jugal and part of maxillary expanded into conspicuous cheek-plate, the surface of this becoming excessively rugose in adult; cheek-teeth strongly hypsodont, but enamel structures not completely multilaminar; external form robust; ears large; tail vestigial; 4 toes on forefoot; 5 toes on hind foot; pelage stiff and appressed. Terrestrial but enters water retadily; lives in burrows.

Only one species, *Agouti paca*, occurs in Central America.

Map 435. *Agouti paca.*

1. *A. p. nelsoni* 2. *A. p. virgatus*

Agouti paca
Paca or Spotted Cavy

Upper parts seal brown, darkest mid-dorsally; sides having 4 lines or rows of spots of creamy white; upper line obscure, tiny, narrow spots; 2nd line consists of distinct, narrow spots; 3rd line a stripe changing to spots on shoulder and hip; 4th line obscure and incomplete; claws pink.

Agouti paca nelsoni Goldman

1913. *Agouti paca nelsoni* Goldman, Smiths. Miscl. Coll., 60(22):9, February 28, type from Catemaco, Veracruz.

MARGINAL RECORDS.—San Luis Potosí: 9 km. NNE Xilitla (Dalquest, 1953b:171). Veracruz: Chichicaxtle (Goldman, 1913:10). Compeche: Apazote (*ibid.*). British Honduras: Bokowina (Laurie, 1953:383). Honduras (Goodwin, 1942:175): Guaymaca; Las Flores. Chiapas: 20 km. SE Teopisca (Goldman, 1913:10). Veracruz: 13 km. ESE Jesús Carranza, 350 ft. (24492 KU); Río Blanco, 15 km. W Piedras Negras, 300 ft. (19887 KU).

Agouti paca virgatus Bangs

1902. *Agouti paca virgatus* Bangs, Bull. Mus. Comp. Zool., 39:47, April, type from Divalá, Chiriquí, Panamá.

MARGINAL RECORDS.—Costa Rica: San Gerónimo (Goodwin, 1946:420). Panamá: Gatún, Canal Zone (Goldman, 1920:132); Cana (Goldman, 1920:131); type locality.

SUBFAMILY DASYPROCTINAE

Genus Dasyprocta Illiger—Agoutis

1811. *Dasyprocta* Illiger, Prodromus systematis mammalium et avium . . . , p. 93. Type by subsequent designation by Thomas (Ann. Mag. Nat. Hist., ser. 7, 12:464, October, 1903) who, by removing to a new genus one of the two species on which *Dasyprocta* was based, left *Mus aguti* Linnaeus, 1766, as the type.

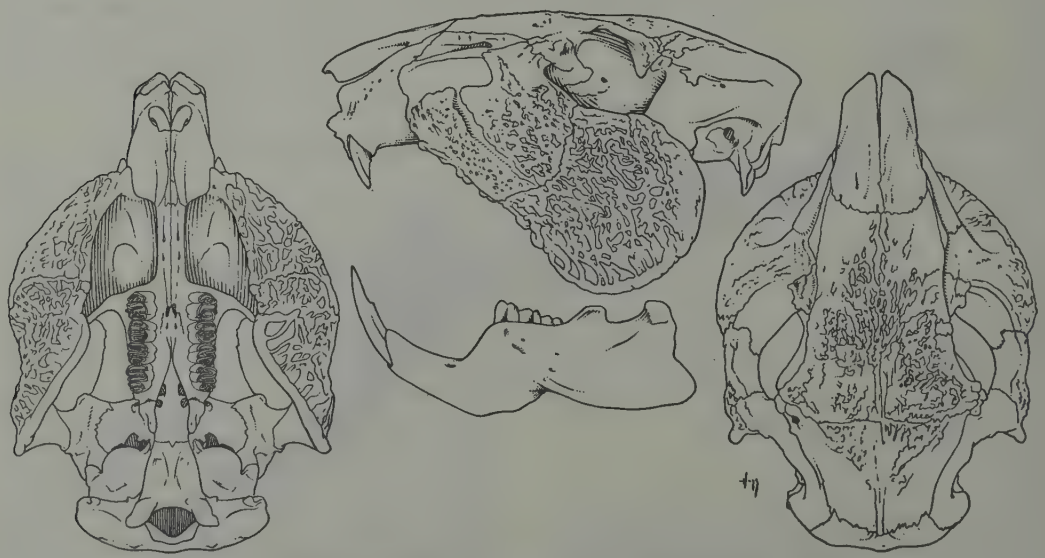


Fig. 434. *Agouti paca nelsoni*, 30 km. SSE Jesús Carranza, 300 feet., Veracruz, No. 32184 K.U., ♂, X ½.

Body form slender, cursorial; hind foot long, narrow, tridactyl, bearing hooflike claws; front foot tetradactyl; tail obsolete; fur on posterior part of body long and thick; length of head and body, 420–610. Skull slender, somewhat rectangular in dorsal aspect; nasals shorter than frontals; frontals broad, relatively flat; weak sagittal crest present in adults; auditory bullae relatively large; paroccipital processes prominent; palatine foramina short, placed well anteriorly; lacrimal much enlarged; angular process of mandible reflected strongly outward; molariform teeth, $\frac{4}{4}$, hypsodont.

In our experience with the animal in Costa Rica, Veracruz, and Panamá, it is essentially diurnal. Nevertheless, where it is much hunted by man it ventures out into open places only in the dim light of early morning and again in the waning light of late evening. The burrows found by us were in cool damp forests among limestone boulders and roots.

A collector in an area where agoutis have been much hunted previously finds them difficult to shoot. Dogs are a help to the hunter.

There is need for a revisionary study of the agoutis. At the present time it is not possible clearly to characterize the species; ranges of individual variation are not known. The following remarks, then, must be regarded as only the merest guide to a complex problem. Indeed, it seems unwise to construct a key based on much more than known geographic distributions.

KEY TO NOMINAL NORTH AMERICAN SPECIES OF DASYPROCTA

1. Occurring on West Indian islands.
   2. Incisive foramina extending posteriorly to maxillo-premaxillary suture.
      3. Known from St. Lucia and Martinique islands. . . *D. antillensis*, p. 790
      3′. Not occurring on St. Lucia or Martinique islands. . . . *D. noblei*, p. 790
   2′. Incisive foramina terminating (posteriorly) anterior to maxillo-premaxillary suture.
      4. Hind foot less than 100. *D. albida*, p. 789
      4′. Hind foot more than 100. *D. aguti*, p. 789
1′. Not occurring on West Indian islands.
   5. Occurring on Coiba Island, Panamá. *D. coibae*, p. 792
   5′. Not occurring on Coiba Island, Panamá.
      6. Occurring in Veracruz. *D. mexicana*, p. 790
      6′. Not occurring in Veracruz.
         7. Occurring in Ruatan Island, Honduras. . . . . *D. ruatanica*, p. 790
         7′. Not occurring on Ruatan Island, Honduras. . . . *D. punctata*, p. 791

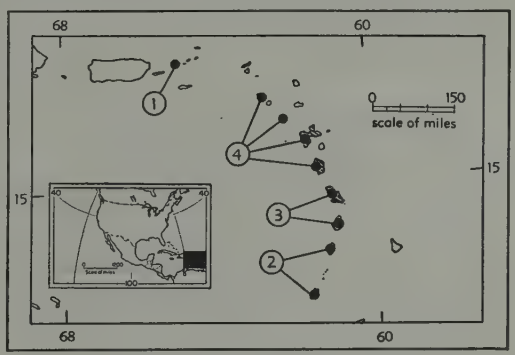
Dasyprocta aguti
Brazilian agouti

Dasyprocta aguti aguti (Linnaeus)

1766. [*Mus*] *aguti* Linnaeus, Syst. nat., ed. 12, 1:80. Type locality, Brazil. Introduced on St. Thomas, Virgin Islands, West Indies (Miller, Proc. U.S. Nat. Mus., 54:508, October 15, 1918).

1829. *D*[*asyprocta*]. *aguti*, Fischer, Synopsis mammalium, p. 379.

The agouti of St. Thomas Island was introduced from South America—probably Brazil—some time prior to 1852. The relationship of *D. aguti* to the other northern South American species has never been satisfactorily determined.



Map 436. Four species of *Dasyprocta*.

1. *D. aguti aguti*
2. *D. albida*
3. *D. antillensis*
4. *D. noblei*

Dasyprocta albida Gray
St. Vincent Agouti

1842. *Dasyprocta albida* Gray, Ann. Mag. Nat. Hist., ser. 1, 10:264, December, type from St. Vincent, Lesser Antilles.

The original description of this species was based on an albinistic individual. In describing another specimen from St. Vincent, G. M. Allen writes that, "It seems to represent a smaller animal than that of Trinidad [*D. rubricata*], with a hind foot of about 95 mm. instead of 109 or 110 as in the latter. The skull is markedly smaller, with a shorter and more sharply tapering rostrum, shorter nasals, and a shorter median frontal suture. The maxillary pit at the inner side of the antorbital foramen is smaller, and circular, instead of large and oval. . . . The skin accompanying the St. Vincent skull seems redder than usual, but can be practically matched with Trinidad skins" (1911:203).

MARGINAL RECORDS.—Lesser Antilles: type locality; Grenada (267382 NM).

Dasyprocta antillensis Sclater
St. Lucia Agouti

1875. *Dasyprocta antillensis* Sclater, Proc. Zool. Soc. London, p. 666 (for 1874), April, type from St. Lucia, Lesser Antilles.

"It is nearly the same size as the Trinidad agouti [*D. rubricata*], but with notably shorter nasals, which tend to be narrower, and to taper slightly at the distal end. The rostrum is noticeably shorter; and the incisive foramina are prolonged posteriorly to reach the maxillo-intermaxillary [?] suture, instead of ending some 3 or 4 mm. anterior to it. The pit in the maxillary bone at the inner side of the antorbital fossa is smaller and more nearly circular" (G. M. Allen, 1911:203).

MARGINAL RECORDS.—Lesser Antilles: type locality; Martinique (293781 NM).

Dasyprocta noblei G. M. Allen
Guadeloupe Agouti

1914. *Dasyprocta noblei* G. M. Allen, Proc. New England Zool. Club, 5:69, October 7, type from Goyave, Guadeloupe, Lesser Antilles.

Measurements of the holotype, an adult female, are: Head and body (from stuffed skin), 415; hind foot with claw, 102; condylobasal length of skull, 90; greatest width of braincase, 33.2. "Differs from *D. antillensis* of Santa Lucia and *D. albida* of St. Vincent, its nearest relatives to the south, in having the top of the head, neck, shoulders, and back, a uniform shining black, with but a trace of ochraceous tipping to the hairs on the anterior part of the back. The reddish tints are almost suppressed, and the sides of the belly are blackish instead of brown. The skull is characterized by the relatively broad posterior expansion of the nasals, the narrow palate, small teeth and short tooth-rows" (G. M. Allen, 1914:69, 71).

MARGINAL RECORDS.—Lesser Antilles: St. Kitts (38072 NM); Dominica (38422 NM); Montserrat (114010 NM); type locality.

Dasyprocta mexicana Saussure
Mexican Agouti

1860. *Dasyprocta mexicana* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:53, type from "hot zone of Mexico"; probably in the State of Veracruz.

The following description is based on specimens in the Museum of Natural History, University of Kansas, that are provisionally referred to this species. Upper parts black middorsally and over rump, fading to grizzled dark brown over shoulders and sides, this coloration resulting from a fading of the black to brown and the addition of pale tips on the hairs; underparts paler and light tips of hairs more prominent, hairs on belly sometimes all dirty white; ears nearly naked, hairs on outer side blackish to brownish, buffy on inside; feet blackish. With wear, enamel loops of molariform teeth become isolated as separate islets.

MARGINAL RECORDS.—Veracruz: 2 km. N Paraje Nuevo, 1700 ft. (32186 KU), thence along Carribbean Coast, then inland to 60 km. SE Jesús Carranza, 450 ft. (24504 KU); 20 km. ENE Jesús Carranza (32188 KU).

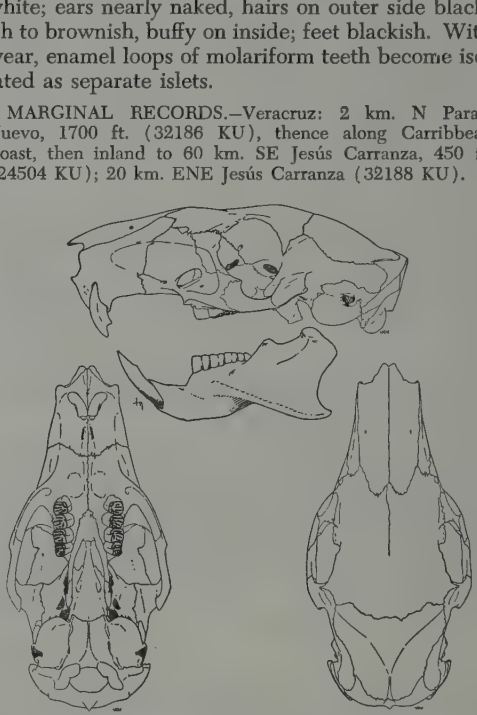


Fig. 435. *Dasyprocta mexicana*, 20 km. ENE Jesús Carranza, 200 ft., Veracruz, No. 32188 K.U., ♀, X ¾.

Dasyprocta ruatanica Thomas
Ruatan Island Agouti

1901. *Dasyprocta ruatanica* Thomas, Ann. Mag. Nat. Hist., ser. 7, 8:272, October, type from Ruatan Island, Bay Islands, Honduras. Known only from the type locality.

"Closely allied to *D. punctata*, but much smaller. . . . Size markedly less than in *D. punctata*. Fur . . . everywhere annulated to the roots with black and ochraceous yellow. . . . Under surface like back, but more olivaceous, and there is a white spot on the chin and a yellow patch on the middle of the lower part of the belly. . . . Ears nearly naked, their few hairs blackish. Limbs like body proximally, darkening terminally on hands and feet to grizzled or deep brown. . . . Skull in general shape closely agreeing with that of the type of *D. punctata*, but conspicuously smaller in all dimensions" (Thomas, 1901:272).

Dasyprocta punctata
Agouti

External measurements: 490–620; 10–35; 110–133. Upper parts variable both geographically and individually; blackish, especially over head and nape, mixed with buff or russet, or distinctly reddish, usually brightest on posterior part of body; underparts usually paler, sometimes even tawny; hairs on rump usually much longer than elsewhere on upper parts.

According to Goldman (1920:129), the Darién agouti (*Dasyprocta punctata dariensis*), like other forms of the group, is shy and seems to be mainly nocturnal in habits; but if carefully searched for it may be found abroad early in the morning or late in the evening, and occasionally in the middle of the day, especially in wet weather. This animal becomes alarmed at the slightest noise and scampers away, often giving the characteristic squeak or short bark eh-h—eh-h. The Indians and resident Negro population hunt the agouti for its flesh and it is one of the favorite game-animals of the region.

Dasyprocta punctata bellula R. Kellogg

1946. *Dasyprocta punctata bellula* R. Kellogg, Proc. Biol. Soc. Washington, 59:59, March 11, type from San José Island, Golfo de Panamá, Panamá. Known only from the type locality.

Dasyprocta punctata callida Bangs

1901. *Dasyprocta callida* Bangs, Amer. Nat., 35:635, August, type from San Miguel Island, Golfo de Panamá, Panamá. Known only from the type locality.

Map 437. Four species of *Dasyprocta*.

Guide to kinds
1. *D. mexicana*
2. *D. ruatanica*
3. *D. punctata bellula*
4. *D. punctata callida*
5. *D. punctata chiapensis*
6. *D. punctata dariensis*
7. *D. punctata isthmica*
8. *D. punctata nuchalis*
9. *D. punctata pallidiventris*
10. *D. punctata punctata*
11. *D. punctata richmondi*
12. *D. punctata underwoodi*
13. *D. punctata yucatanica*
14. *D. coibae*

1946. *Dasyprocta punctata callida*, R. Kellogg, Proc. Biol. Soc. Washington, 59:59, March 11.

Dasyprocta punctata chiapensis Goldman

1913. *Dasyprocta punctata chiapensis* Goldman, Smiths. Miscl. Coll., 60(22):13, February 28, type from Huehuetán, Chiapas.

MARGINAL RECORDS.—Guatemala: probably in highlands (Handley, 1950:153). Chiapas (Goldman, 1913:13): *Chicharras*; type locality.

Dasyprocta punctata dariensis Goldman

1913. *Dasyprocta punctata dariensis* Goldman, Smiths. Miscl. Coll., 60(22):11, February 28, type from near head Río Limón, 5200 ft., Mt. Pirri, Panamá.

MARGINAL RECORDS.—Panamá (Goldman, 1920:129): Chepigana; Real de Santa María; type locality.

Dasyprocta punctata isthmica Alston

1876. *Dasyprocta isthmica* Alston, Proc. Zool. Soc. London, p. 347, August, type from Colón, Canal Zone, Panamá.
1913. *D[asyprocta]. punctata isthmica*, Goldman, Smiths. Miscl. Coll., 60(22):11, February 28.

MARGINAL RECORDS.—Panamá (Goldman, 1920:127): *type locality*; Gatún, Canal Zone; Boquete; Maxon Ranch, Río Trinidad.

Dasyprocta punctata nuchalis Goldman

1917. *Dasyprocta punctata nuchalis* Goldman, Proc. Biol. Soc. Washington, 30:113, May 23, type from Divalá, Chiriquí, Panamá.

MARGINAL RECORDS.—Panamá: Bugaba (Goldman, 1920:129); type locality.

Dasyprocta punctata pallidiventris Bole

1937. *Dasyprocta punctata pallidiventris* Bole, Sci. Publ. Cleveland Mus. Nat. Hist., 7:182, August 31, type from Paracoté, 1½ mi. S mouth Angulo River, Mariato-Suay Lands, Veraguas, Panamá. Known only from the type locality.

Dasyprocta punctata punctata Gray

1842. *Dasyprocta punctata* Gray, Ann. Mag. Nat. Hist., ser. 1, 10:264, December. Type locality restricted (Goodwin, Bull. Amer. Mus. Nat. Hist., 87:417, December 31, 1946) to Realejo, Nicaragua.

MARGINAL RECORDS.—Honduras (Goodwin, 1942: 173–174): La Florida; Roman River; El Guayabal; El Horno. Costa Rica (Goodwin, 1946:418): Vijagua; Esparta, thence along coast to Guatemala: *probably Pacific lowlands* (Handley, 1950:153).

Dasyprocta punctata richmondi Goldman

1917. *Dasyprocta punctata richmondi* Goldman, Proc. Biol. Soc. Washington, 30:114, May 23, type from Escondido River, 50 mi. above Bluefields, Nicaragua.

MARGINAL RECORDS.—British Honduras: Belize (Laurie, 1953:383), thence along Caribbean Coast to Costa Rica (Goodwin, 1946:418): Cuabre; Talamanca, probably near Sipurio; San José; Vijagual. Nicaragua: type locality. Honduras: Monte Redondo (Goodwin, 1942:174); El Caliche Cedros (*ibid.*).

Dasyprocta punctata underwoodi Goldman

1931. *Dasyprocta punctata underwoodi* Goldman, Jour. Washington Acad. Sci., 21:481, November 19, type from San Gerónimo, Pirrís, San José, Costa Rica.

MARGINAL RECORDS.—Costa Rica (Goodwin, 1946: 419): Pozo Pital; type locality; Agua Buena; Palmar.

Dasyprocta punctata yucatanica Goldman

1913. *Dasyprocta punctata yucatanica* Goldman, Smiths. Miscl. Coll., 60(22):12, February 28, type from Apazote, near Yohaltún, Campeche.

MARGINAL RECORDS.—Campeche: La Tuxpana (Goldman, 1913:13), thence along coast to British Honduras: El Cayo (Murie, 1935:28). Guatemala: Uaxactún (*ibid.*).

Dasyprocta coibae Thomas
Coiba Island Agouti

1902. *Dasyprocta coibae* Thomas, Nov. Zool., 9:136, April 10, type from Coiba Island, Panamá. Known only from the type locality.

"Size about as in *D. isthmica*. Fur coarse and sparse; rump hairs less conspicuously lengthened than usual—about 3 in. in length. General colour above coarsely grizzled brown . . . the hairs ringed with brown and orange; where they lengthen on the rump they are still ringed with the same two colours, but the tips are broadly orange, almost as in *D. isthmica*. Undersurface soiled yellowish, the hairs both of throat and belly brown basally and yellow terminally. Crown blackish brown. Ears nearly naked, the sparse hairs brown. Arms and legs like body, uppersurface of hands and feet black. Tail naked, about an inch in length, and therefore decidedly longer than usual. Skull broad and thickly built. Nasals parallel-sided, not tapering" (Thomas, 1902:136).

FAMILY CAPROMYIDAE—Hutias and Coypus

Upper molars evergrowing (Plagiodontinae and Capromyinae) or not (Myocastorinae), but when not evergrowing then extremely hypsodont; paroccipital processes long, usually straight, and not closely appressed to auditory bullae; size varying from that of a guinea-pig to that of a small dog.

This family—as here constituted—comprises a diverse assemblage of genera some of which are known from live specimens and others from only bones that were recovered from cave deposits.

Scarcely any two authorities agree on the classification of the Antillean hystricomorph genera and especially as concerns the genera here included in this family. In effect, the classification we employ is more than a little arbitrary, but it does seem to warrant usage slightly more than some others, say, that of Ellerman (1940) or of Simpson (1945).

KEY TO SUBFAMILIES AND GENERA OF CAPROMYIDAE

1. External body form strongly modified for aquatic life; upper molars strongly hypsodont. . . . . subfamily Myocastorinae, p. 799
   Myocastor, p. 799
1′. External body form not modified for aquatic life; upper molars not strongly hypsodont.
   2. Enamel pattern of upper molars tetramerous, folds long, deep, and obliquely arranged. . subfamily Plagiodontinae, p. 796
      3. Root of upper incisor occurring at anterior margin of zygomatic process of maxillary; P4 with one external re-entrant angle. . . . *Plagiodontia*, p. 796
      3′. Root of upper incisor occurring in infraorbital foramen; P4 with 2 external re-entrant angles, its enamel pattern markedly different from that of molars.
         4. Crowns and alveoli of upper and lower molars approximately as long as wide. . . *Isolobodon*, p. 798
         4′. Crowns and alveoli of upper and lower molars markedly wider than long. . . . . *Aphaetreus*, p. 798
   2′. Enamel pattern of upper molars pentamerous or hexamerous.
      subfamily Capromyinae, p. 793
      5. Enamel pattern of upper molars pentamerous; roots of lower cheek-teeth evenly spaced in mandible.
         6. Tail much longer than hind foot.
            Capromys, p. 793
         6′. Tail little if any longer than hind foot. . . . . *Geocapromys*, p. 795
      5′. Enamel pattern of upper molars hexamerous; root of p4 diverging sharply forward away from that of m1.
         Hexolobodon, p. 796

SUBFAMILY CAPROMYINAE

Genus Capromys Desmarest—Hutias

Revised by Chapman (Bull. Amer. Mus. Nat. Hist., 14: 313–323, November 12, 1901) and by Mohr (Mitt. Zool. Mus. Hamburg, 48:51–80, May, 1939). The *Capromys elegans* of Cabrera (Bol. Soc. Española Hist. Nat. Madrid, 1:372, December, 1901) based on a specimen supposed to have been collected in Cuba, is a member of the Philippine genus *Phloeomys*. (See Cabrera, Trab. Mus. Cien. Nat., Madrid, No. 3, p. 30, 1912.)

1822. *Capromys* Desmarest, Bull. Soc. Philom. Paris, p. 185, December. Type, *Capromys fournieri* Desmarest [= *Isodon pilorides* Say].

"Skull long and rather flat, a postorbital-like ridge can be present . . . jugal with well marked and strong backwardly directed process. Bullae prominent. Paroccipital process usually slightly lengthened. . . . Infraorbital foramen with no canal for nerve transmission. Palate slightly constricted anteriorly, but less so than in *Myocastor* or *Dactylomys*; palatal foramina medium. Mandible with angular process drawn backwards, and strongly lifted outwards; condyle high; coronoid process low. . . . Externally rather large as a rule; fur harsh; feet broad, of arboreal type . . . claws prominent, D. 5 relatively long, hallux medium. . . . Tail long, haired, said to be prehensile in at least one species, and may be so throughout the genus." (Ellerman, 1940:128–129.)

KEY TO SPECIES OF CAPROMYS

1. Size small; vertical diameter of orbit exceeding height of infraorbital foramen; no secondary hepatic lobe at base of principal left anterior lobe. . . . . *C. nana*, p. 795
1′. Size larger; vertical diameter of orbit not exceeding height of infraorbital foramen; secondary hepatic lobe present at base of principal left anterior lobe.
   2. Liver much subdivided into small glandular masses; caudal vertebrae fewer than 25; vertical diameter of orbit less than height of infraorbital foramen.
      C. pilorides, p. 793
   2′. Liver not subdivided into small glandular masses; caudal vertebrae more than 25; vertical diameter of orbit and height of infraorbital foramen approximately equal.
      3. Thoracic vertebrae 18; tail markedly prehensile. . . . *C. prehensilis*, p. 794
      3′. Thoracic vertebrae 17; tail not markedly prehensile and in life easily broken off. . . . *C. melanurus*, p. 794

Subgenus Capromys Desmarest

1822. *Capromys* Desmarest, Bull. Soc. Philom. Paris, p. 185, December. Type, *Capromys fournieri* Desmarest [= *Isodon pilorides* Say].

Capromys pilorides
Desmarest's Hutia

External measurements of 6 adults, including both sexes, are: 710–810; 170–255; 95–100; 27, 28

(2 specimens only). Upper parts varying from black and pale buff to black and deep rusty; underparts varying from buffy whitish to that of the back, but usually somewhat intermediate; tail unicolor, varying from buffy to dark reddish brown. Skull large and heavily built.

A female contained 4 embryos.

Capromys pilorides pilorides (Say)

1822. *I[sodon]. pilorides* Say, Jour. Acad. Nat. Sci. Philadelphia, 2:333, November. Type locality, "South America or one of the West Indian islands." Known from various localities throughout Cuba (see Mohr, Mitt. Zool. Mus. Hamburg, 48:73, May, 1939).

1848. *Capromys pilorides*, Waterhouse, A natural history of the Mammalia, 2:287.

1822. *Capromys fournieri* Desmarest, Mem. Soc. Hist. Nat. Paris, 1:43, pl. Type locality, Cuba.

Not mapped.

Capromys pilorides relictus G. M. Allen

1911. *Capromys pilorides relictus* G. M. Allen, Bull. Mus. Comp. Zool., 54:207, July, 1911, type from Casas Mts., Nueva Gerona, Isle of Pines, Cuba. Known only from the type locality. Not mapped.

Subgenus Mysateles Lesson

1842. *Mysateles* Lesson, Nouveau tableau du règne animal . . . Mammifères, p. 124. Type, *Mysateles poeppingii* Lesson [= *Capromys prehensilis* Poeppig].

Capromys prehensilis
Prehensile-tailed Hutia

External measurements of an adult male from San Diego de los Baños, Cuba, are: 710, 305, 82, 30. Upper parts a mixture of blackish, buffy, and rufous shades; underparts whitish to brownish, often white anteriorly and brown posteriorly; tail bright rufous to brownish, sometimes partly or almost completely denuded by abrasion. Skull less than half the bulk of that of *C. pilorides*.

Mysateles is stated by Mohr (1939:51, 54) to be of subgeneric rank. Thereafter, in the same work, *Mysateles* is employed in name combinations as a generic name.

Capromys prehensilis gundlachi Chapman

1901. *Capromys prehensilis gundlachi* Chapman, Bull. Amer. Mus. Nat. Hist., 14:317, November 12, type from Nueva Gerona, Isle of Pines, Cuba. Known only from the type locality.

Capromys prehensilis pallidus Peters

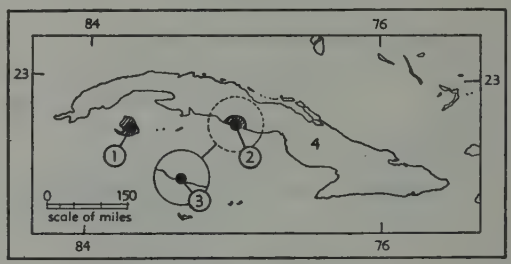
1865. *C[apromys]. pallidus* Peters, Monatsb. preuss. Akad. Wiss., Berlin, p. 384, type from Cuba. Known definitely from the vicinity of Trinidad, Cuba.

1955. *Capromys prehensilis pallidus*, Miller and Kellogg, Bull. U. S. Nat. Mus., 205:641, March 3.

Capromys prehensilis poeyi Guérin

1834. *Capromys poeyi* Guérin, Mag. Zool., Paris, Ann. 4, Cl. I, pl. 15, type from Cuba. Known definitely from Trinidad, Cuba.

1955. *Capromys prehensilis poeyi*, Miller and Kellogg, Bull. U.S. Nat. Mus., 205:641, March 3.



Map 438. *Capromys prehensilis*.

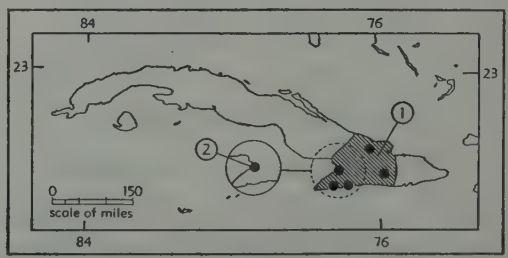
1. *C. p. gundlachi*
2. *C. p. pallidus*
3. *C. p. poeyi*
4. *C. p. prehensilis*

Capromys prehensilis prehensilis Poeppig

1824. *Capromys prehensilis* Poeppig, Jour. Acad. Nat. Sci. Philadelphia, 4:11, type from wooded parts of southern Cuba. Known from various localities throughout Cuba (see Mohr, Mitt. Zool. Mus. Hamburg, 48:56, May, 1939).

Capromys melanurus
Bushy-tailed Hutia

Closely resembling *C. prehensilis* except as follows: *C. melanurus* has slightly more inflated frontals; less developed postorbital processes; markedly narrower basioccipital region; tail not used as a prehensile organ and is easily detached basally in life; tail bushier and much darker (black to rusty).



Map 439. *Capromys melanurus*.

1. *C. m. melanurus*
2. *C. m. rufescens*

Capromys melanurus melanurus Peters

1864. *Capromys melanurus* Peters, Monatsb. preuss. Akad. Wiss., Berlin, p. 384, type from Manzanillo, Cuba.

MARGINAL RECORDS.—Cuba (Mohr, 1939:60): Holguin; San Luis; Turquino; Portillo; type locality. Localities not found: Yao Arriba; Cuabitas.

Capromys melanurus rufescens (Mohr)

1939. *Mysateles melanurus rufescens* Mohr, Mitt. Zool. Mus. Hamburg, 48:62, May, 1939, type from Manzanillo, Cuba. Known only from the type locality.
1955. *Capromys melanurus rufescens*, Miller and Kellogg, Bull. U.S. Nat. Mus., 205:641, March 3.

Capromys nana G. M. Allen
Dwarf Hutia

1917. *Capromys nana* G. M. Allen, Proc. New England Zool. Club, 6:54, March 29, type from Sierra de Hato Nuevo, Matanzas, Cuba.

External measurements of an adult female are: 395; 176; 45; 19. Size about that of a Norway rat. Upper parts a mixture of black hairs having ochraceous tips; tips becoming whitish on muzzle and in front of ear and darker over rump; underparts pale grayish on chin, middle of belly, and inner surface of legs, elsewhere like upper parts but paler; tail sharply bicolor, like rump in proximal 2 cm., distally hairs becoming much shorter and black above, pale ochraceous buff below; ears sparsely clothed with short, black hairs. Braincase shorter and more rounded than in other species; orbit especially large (for the genus), larger than antorbital foramen; supraorbital ridge beaded; bony palate bearing knifelike median bony ridge which is somewhat extended posteriorly as a spine.

MARGINAL RECORDS.—Cuba: near Limones (Mohr, 1939:63); Daiquirí (Morrison-Scott, 1939:214); Ciénega de Zapata (*ibid.*). Not mapped.

Genus Geocapromys Chapman—Hutias

Reviewed by Lawrence, Occas. Papers Boston Soc. Nat. Hist., 8:189–193, November 7, 1934. *Geocapromys* regarded as a subgenus of *Capromys* and revised by Mohr (Mitt. Zool. Mus. Hamburg, 48:75–80, May, 1939) who uses *Geocapromys* in name combinations as a generic name.

1901. *Geocapromys* Chapman, Bull. Amer. Mus. Nat. Hist., 14:314, November 12. Type, *Capromys brownii* Fischer.
1917. *Synodontomys* G. M. Allen, Bull. Mus. Comp. Zool., 61:5, January. Type, *Capromys columbianus* Chapman.

In general, resembling *Capromys* but differing as follows: Preorbital bar of maxilla vertical or sloping slightly backward; root capsule of upper incisor terminating above and lateral to anterior half of outer border of alveolus of P4; bases of alveoli of right and left P4 in contact, encroaching on floor of narial passage; p4 with a small third re-entrant angle on lingual side (after Miller, 1929b:2).

Key to Species of Geocapromys
(modified from Lawrence, 1934:193)

1. Alveolar length of lower cheek-teeth less than 17.5 (rarely more).
   2. Lower posterior margin of jugal forming nearly a right angle with a more or less prominent posteriorly directed spine. *G. brownii*, p. 795
   2′. Lower posterior margin of jugal sloping strongly forward forming an obtuse angle; no posterior projection. . *G. ingrahami*, p. 796
1′. Alveolar length of lower cheek-teeth usually more than 18.0.
   3. Frontals inflated anteriorly; postorbital region markedly constricted; postorbital processes short and bluntly triangular. *G. brownii*, p. 795
   3′. Frontals not inflated; no postorbital constriction or postorbital processes. *G. columbianus*, p. 796

Geocapromys brownii
Brown's Hutia

External measurements (dry) and description of an adult male from Jamaica are: 450, 35, 60, 6 (from crown). Upper parts blackish, underparts uniform dusky brown. Skull differs from those of other species of *Geocapromys* in "absence of supraorbital processes, the relatively greater width at the interorbital constriction, the narrowness and relative greater height of the condyle of the lower jaw" (Chapman, 1901:321).

Geocapromys brownii brownii (Fischer)

1830. *Capromys brownii* Fischer, Synopsis mammalium, Addenda, p. 389 (= 589). Type locality, Jamaica. Known only from Jamaica.
1917. *Geocapromys brownii*, G. M. Allen, Bull. Mus. Comp. Zool., 61:8, January.
1851. *Capromys brachyurus* Gosse, A naturalist's sojourn in Jamaica, p. 471. Type locality, Jamaica.

Not mapped.

Geocapromys brownii thoracatus (True)

1889. *Capromys brachyurus thoracatus* True, Proc. U.S. Nat. Mus., 11:469, September 3, type from Little Swan Island, Gulf of Honduras. Known only from Little Swan Island.
1939. *Geocapromys browni thoracatus*, Mohr, Mitt. Zool. Mus. Hamburg, 48:77, May.

Not mapped.

Geocapromys ingrahami
Ingraham's Hutia

This species is known only from fragments of bone and differs from other congeners in seemingly smaller size and in that the lower posterior margin of the jugal, which slopes strongly forward, forms an obtuse angle. The jugal lacks a posterior projection.

Geocapromys ingrahami abaconis Lawrence

1934. *Geocapromys ingrahami abaconis* Lawrence, Occas. Papers Boston Soc. Nat. Hist., 8:191, November 7, type from Imperial Lighthouse Caves, Hole in the Wall, Great Abaco Island, Bahama Islands. Known only from Great Abaco Island. Not mapped.

Geocapromys ingrahami ingrahami (J. A. Allen)

1891. *Capromys ingrahami* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:329, August 31, type from East Plana Cay, Plana Keys, Bahama Islands. Known only from the type locality.

1917. *G[eocapromys]. ingrahami*, G. M. Allen, Bull. Mus. Comp. Zool., 61:9, January.

Not mapped.

Geocapromys ingrahami irrectus Lawrence

1934. *Geocapromys ingrahami irrectus* Lawrence, Occas. Papers Boston Soc. Nat. Hist., 8:190, November 7, type from "Burial Cave No. 1," Gordon Hill Caves, Crooked Island, Bahama Islands.

MARGINAL RECORDS (Mohr, 1939:79).—Bahama Islands: type locality; Long Island; Eleuthera Island; Exhuma Island. Not mapped.

Geocapromys columbianus (Chapman)
Cuban Hutia

1892. *Capromys columbianus* Chapman, Bull. Amer. Mus. Nat. Hist., 4:314, December 29, type from cave near Trinidad, Cuba.

1918. *Geocapromys columbianus*, G. M. Allen, Bull. Mus. Comp. Zool., 62:145, May.

1917. *Geocapromys cubanus* G. M. Allen, Bull. Mus. Comp. Zool., 61(1):9, January, type from Sierra de Hato-Nuevo, Matanzas, Cuba.

Known only from sub-fossil fragments. Space between inner borders of alveoli at anterior margin of upper premolars exceedingly narrow because maxillary tooth-rows converge anteriorly and nearly touch each other; median palatal ridge disappears posteriorly; posterior nares much narrowed. Alveolar length of upper cheek-teeth of an adult is 21.

MARGINAL RECORDS.—Cuba: Sierra de Hato-Nuevo (G. M. Allen, 1917:9); type locality; Daiquirí (Mohr, 1939: 80); Isla de Pinos (Koopman and Ruibal, 1955:5). Not mapped.

Genus Hexolobodon Miller—Haitian Hutia

1929. *Hexolobodon* Miller, Smiths. Miscl. Coll., 81(9):19, March 30. Type, *Hexolobodon phenax* Miller.

So far as known resembling *Geocapromys*, but differing as follows: cheek-teeth with roots becoming closed at, or soon after, the stage when crowns are worn flat; root of lower incisor passing beneath root of m3 and terminating, in fully adult individuals, on outer side of tooth-row beneath floor of groove that separates alveolus of m3 from base of coronoid process; p4 with only 2 re-entrant angles on inner side (as in *Capromys*); all maxillary teeth having 2 about equally developed re-entrant angles on each side, these imparting to crowns an evenly 6-lobed structure (after Miller, 1929a:19–20).

The genus is monotypic.

Hexolobodon phenax Miller
Haitian Hutia

1929. *Hexolobodon phenax* Miller, Smiths. Miscl. Coll., 81 (9):20, March 30, type from small cave near St. Michel, Haiti.

"An animal about the size of *Capromys pilorides*, but skull probably differing from that of all species of *Capromys* and *Geocapromys* in shorter rostrum and generally more robust form." See also generic description (Miller, 1929a:20).

MARGINAL RECORDS.—Haiti: type locality; caves near l'Atalaye (Miller, 1929a:22). Not mapped.

Subfamily PLAGIODONTINAE

Genus Plagiodontia F. Cuvier—Hutias

Species reviewed by Mohr (Mitt. Zool. Mus. Hamburg, 48:81–87, May, 1939) and by Johnson (Proc. Biol. Soc. Washington, 61:69–76, June 16, 1948).

1836. *Plagiodontia* F. Cuvier, Ann. Sci. Nat., ser. 2, 6:347. Type, *Plagiodontia aedium* F. Cuvier.

Length of head and body of known males, 312–405. Form stout, feet robust, tail naked and "of moderate length" (Ellerman, 1940:134). Enamel pattern of upper molars tetramerous, folds long, deep, obliquely arranged; molars not strongly hypsodont; zygomatic arches slender; paroccipital processes especially long and slender; little interorbital and palatal constriction.

The genus was first known from sub-fossil bone fragments. Now two species, *P. aedium* and *P. hylaeum*, of the 4 species, are known in the living state.

KEY TO SPECIES OF PLAGIODONTIA
(after Johnson, 1948:73–74)

1. Skull smaller, alveolar length of mandibular tooth-row less than 18; postorbital processes (at least in *P. aedium*) almost absent.
   2. M3 with posterior fold and accessory process; length of occlusal surface of M3 2.7; alveolar length of mandibular tooth-row 16.3. . . . . *P. spelaeum*, p. 797
   2′. M3 lacking posterior fold and accessory process; length of occlusal surface of M3 3.8; alveolar length of mandibular tooth-row 16.5. . . . . *P. aedium*, p. 797
1′. Skull larger, alveolar length of mandibular tooth-row more than 18; postorbital processes prominent.
   3. Labial and posterior lingual folds of lower cheek-teeth overlapping; postorbital processes relatively long and slender; alveolar length of mandibular tooth-row approximately 20. . . . *P. hylaeum*, p. 797
   3′. Labial and posterior lingual folds of lower cheek-teeth meeting without overlapping; postorbital processes blunter; alveolar length of mandibular tooth-row approximately 24. . . . *P. ipnaeum*, p. 797

Plagiodontia aedium F. Cuvier
Cuvier's Hutia

1836. *Plagiodontia aedium* F. Cuvier, Ann. Sci. Nat., ser. 2, 6:347. Type locality, Dominican Republic.

External measurements of an alcoholic specimen with skull removed are: 465, 153, 67, 18. Pelage of the same specimen is as follows: Upper parts chiefly "gray-based and whitish-tipped hairs between 30 and 40 mm. long, with a sparse intermixture of gray underfur and a few longer, wholly dark bristles; fur of underparts shorter, whitish basally and tipped with a buffy shade" (Johnson, 1948:70–71). Skull relatively small (greatest length approximately 69); postorbital processes of frontal barely discernible; a single well-defined pair of palatal pits; incisors and cheek-teeth small; labial and lingual folds of lower cheek-teeth moderately overlapping.

MARGINAL RECORDS.—Haiti: near Miragoane (Johnson, 1948:71). Dominican Republic (Miller, 1929c:8–9): Anadel; [mouth of] Río San Juan; Kilometer 2 site; Kilometer 4 site. Not mapped.

Plagiodontia ipnaeum Johnson
Johnson's Hutia

1948. *Plagiodontia ipnaeum* Johnson, Proc. Biol. Soc. Washington, 61:72, June 16, type from kitchen-midden deposit at a Ciguayan village site at Anadal, 2 km. E Samaná, Samaná Province, Dominican Republic.

Judging from the skull, *P. ipnaeum* is the largest species of the genus; postorbital processes prominent, but projecting less than in *P. hylaeum*; skull deep; palate constricted anteriorly; palatal pits opposite middle of M1; pterygoid vacuity broad, its anterior margin obtusely pointed; upper tooth-rows closely approximated anteriorly, divergent posteriorly; cheek-teeth progressively smaller from P4 to M3, with greatest difference between P4 and M1; mandible . . . more massive than in other species; angular process greatly expanded horizontally (after Johnson, 1948:72).

This species was incorrectly identified as *Plagiodontia aedium* by Miller, for example in 1929 (1929a:18).

MARGINAL RECORDS (Johnson, 1948:73).—Dominican Republic: type locality; mouth San Juan River, 10 km. N Samaná; near Monte Cristi; near Constanza, La Vega Province; San Pedro de Macoris. Haiti: Atalaye Plantation, near St. Michel. Not mapped.

Plagiodontia hylaeum Miller
Dominican Hutia

1927. *Plagiodontia hylaeum* Miller, Proc. U. S. Nat. Mus., 72(16):4, September 30, type from Guarabo, 10 mi. E Jovero, Samaná Province, Dominican Republic.

Measurements of males are as follows: Length of head and body, 348–405; tail, 127–146. As compared with *P. aedium*, "smaller scales on tail and feet; narrower feet with longer and sharper claws; pinna of ear less hairy, its margin more thickened and more evenly rounded; color seemingly darker in general, contour hairs with less contrasting tips, cheeks and underparts essentially similar in color to back rather than distinctly paler, a whitish pectoral spot occasionally present" (Johnson, 1948:72).

MARGINAL RECORDS (Johnson, 1948:72, unless otherwise noted).—Dominican Republic: type locality; near Constanza, La Vega Province; San Gabriel [Island] (Miller, 1929c:9). Haiti: Trujin, Massif de La Selle; Atalaye Plantation, near St. Michel. Not mapped.

Plagiodontia spelaeum Miller
Little Hutia

1929. *Plagiodontia spelaeum* Miller, Smiths. Miscl. Coll., 81 (9):18, March 30, type from Crooked Cave near Atalaye Plantation, 4 mi. E St. Michel, Haiti. Known only from the type locality. Not mapped.

Smallest species of *Plagiodontia*; in such characters as can be distinguished in fragmentary material resembling *P. hylaeum* rather than other species; palate moderately constricted anteriorly;

upper cheek-teeth as in *P. hylaeum* except that M3 relatively smaller; secondary fold on posterior margin of M3 well developed; labial and lingual folds of lower cheek-teeth overlapping about as in *P. aedium* and less so than in *P. hylaeum* (after Johnson, 1948:73).

Genus **Isolobodon** J. A. Allen—Hutias

1916. *Isolobodon* J. A. Allen, Ann. New York Acad. Sci., 27: 19, January 25. Type, *Isolobodon portoricensis* J. A. Allen.

1922. *Ithydontia* Miller, Smiths. Miscl. Coll., 74(3):4, October 16. Type, *Ithydontia levir* Miller.

Curve of upper incisor long, its root lying in antorbital foramen; lower incisor terminating beneath M3; P4 with 2 outer re-entrant angles, its enamel pattern obviously different from that of molars; re-entrant folds in upper teeth not very oblique, their slant more than 45° as referred to corresponding alveolar line; re-entrant folds on inner side of lower teeth extending more than halfway across crowns; frontal sinus not sufficiently inflated to produce obvious swelling over anterior zygomatic root or to encroach on area of antorbital foramen or of orbit; posterior margin of zygomatic process of maxillary lying at or behind level of middle of alveolus of P4.

Opposed inner and outer re-entrant angles of all teeth remaining distinct throughout life, the enamel pattern of each tooth entire; crowns and alveoli of both upper and lower molars nearly as long as wide (after Miller, 1929a:17).

KEY TO SPECIES OF ISOLOBODON

1. Mandibular tooth-row 17.4 or less. *I. levir*, p. 798

1′. Mandibular tooth-row more than 17.4. *I. portoricensis*, p. 798

Isolobodon portoricensis J. A. Allen
Allen's Hutia

1916. *Isolobodon portoricensis* J. A. Allen, Ann. New York Acad. Sci., 27:19, January 25, type from Cueva de la Ceiba, near Utuado, Puerto Rico.

Owing to the unsatisfactory nature of known material, it is not yet possible adequately to describe the species nor to compare them in as much detail as is desirable. Seemingly, *I. portoricensis* differs from *I. levir* in longer mandibular tooth-row (more than 17.4 as opposed to less); greater length of frontal along median suture (more than 21.0 as opposed to less); wider rostrum (more than 12.0 at premaxillary suture as opposed to less); greater interorbital breadth (more than 19.0 as opposed to less).

The natural distribution of the species of this genus seems to have been much altered by man in pre-Columbian times.

MARGINAL RECORDS.—Puerto Rico: various localities (Miller, 1929a:15–17; Anthony, 1918:400), probably throughout the island. Dominican Republic: various sites in vicinity of Samaná Bay (Miller, 1929c:7). Virgin Islands: St. Thomas (Miller, 1918:508); St. Croix (*ibid.*). Not mapped.

Isolobodon levir (Miller)
Miller's Hutia

1922. *Ithydontia levir* Miller, Smiths. Miscl. Coll., 74(3):5, October 16, type from larger of 2 caves NE St. Michel de l'Atalye, Haiti.

1929. *Isolobodon levir* Miller, Smiths. Miscl. Coll., 81(9): 14, March 30.

See account of *I. portoricensis.*

MARGINAL RECORDS.—Haiti: type locality. Dominican Republic: sites in vicinity of Samaná Bay (Miller, 1929c: 7). Not mapped.

Genus **Aphaetreus** Miller—Montane Hutia

1922. *Aphaetreus* Miller, Smiths. Miscl. Coll., 74(3):3, October 16. Type, *Aphaetreus montanus* Miller.

Mandible and its teeth resembling those of *Isolobodon* or *Plagiodontia;* mandibular cheek-teeth prismatic, growing from persistent pulps, their essential structure as in the 2 related genera but entire tooth-row appearing as if compressed anteroposteriorly with result that spaces occupied by dentine and those by cement are narrowed, owing to enamel plates being closer together; crown of each tooth obviously wider than long instead of seemingly longer than wide; inner re-entrant angles confluent with posteroexternal angle, causing enamel pattern to consist of an anterior Y and a posterior I completely isolated from each other by band of cement; m3 nearly as large as m2 (after Miller, 1922:3).

The genus is monotypic and was arranged as a subgenus of *Plagiodontia* by Mohr (1939:88).

Aphaetreus montanus Miller
Montane Hutia

1922. *Aphaetreus montanus* Miller, Smiths. Miscl. Coll., 74 (3):4, October 16, type from larger of 2 caves NE St. Michel de l'Atalye, Haiti.

See characters of the genus.

MARGINAL RECORDS.—Haiti: type locality. Dominican Republic: San Gabriel Island (Miller, 1929c:8). Not mapped.

SUBFAMILY MYOCASTORINAE

Genus Myocastor Kerr—Coypus

1792. *Myocastor* Kerr, The animal kingdom . . . , p. 225. Type, *Mus coypus* Molina.
1805. *Myopotamus* É. Geoffroy St.-Hilaire, Ann. Mus. Hist. Nat., Paris, 6:82. Type, *Myopotamus bonariensis* É. Geoffroy St.-Hilaire.

Large (length of head and body approximately 500), robust, compact; strongly specialized for aquatic life; skull heavy, well-ridged; paroccipital process greatly elongated and curved slightly anteriorly at distal end; frontals broad and flattened; small postorbital process present; palate constricted anteriorly; no accessory canal in infraorbital foramen; upper cheek-teeth decreasing markedly in size anteriorly, markedly hypsodont, semi-rooted, with strong and persistent inner and outer re-entrant folds surrounded by wide enamel. Feet short, pentadactyl, and webbed posteriorly.

The genus seems to be monotypic.

Myocastor coypus
Nutria

Pelage consisting of two types of hair, a thick, dense underfur and the overlying harsh guard hairs. Upper parts rich glossy brown or chestnut; underparts paler; tail nude and scaly.

The habitat of this animal is much the same as that of the native muskrat (*Ondatra*). The nutria has been introduced into the United States and has become established and is spreading, to some extent at the expense of the muskrat. The introduced subspecies of the nutria probably is:

Myocastor coypus bonariensis (É. Geoffroy St.-Hilaire)

1805. *Myopotamus bonariensis* É. Geoffroy St.-Hilaire, Ann. Mus. Hist. Nat., Paris, 6:82, type from Argentina.
1917. *Myocastor coypus bonariensis*, Thomas, Ann. Mag. Nat. Hist., ser. 8, 20:100, July.

SOME STATE RECORDS.—Louisiana (Lowery, 1943: 248); Ohio (Petrides and Leedy, 1948:182); Montana (Jellison, 1946:432); Washington and Oregon (Larrison, 1943: 3–9); British Columbia (Holdom, 1944:30); California (Howard, 1953:512); Nebraska (Jones, 1957:278); Kansas (Hoffmeister and Kennedy, 1947:455); New Mexico (Sooter, 1943:503); Florida (Griffo, 1957:212). Not mapped.

FAMILY ECHIMYIDAE—Spiny Rats

Upper molars rooted, flat-crowned; inner and outer re-entrant folds becoming isolated on crown surface with wear; or, heavier, more complex dentition which tends toward a series of transverse laminae. Paroccipital processes curved forward under prominent auditory bullae; frontals broad, flattened. Externally [so far as known] more or less ratlike; tendency present for development of spiny covering, which is in rare cases strongly developed. Forefeet tetradactyl, hind feet pentadactyl.

KEY TO NORTH AMERICAN GENERA OF ECHIMYIDAE

1. Occurring on Antillean islands.
   2. Upper cheek-teeth (only) showing strong tendency toward formation of a series of transverse laminae; occurring on Martinique. . . . . *Echimys*, p. 802
   2′. Upper cheek-teeth not showing tendency toward formation of transverse laminae; not occurring on Martinique.
      3. Upper cheek-teeth with one internal re-entrant fold and 3 isolated enamel lakes.
         4. Palate (postpalatal notch to incisive alveolus) more than 28. . . . . *Homopsomys*, p. 804
         4′. Palate less than 28. . . . . *Heteropsomys*, p. 803
      3′. Upper cheek-teeth having outer as well as inner re-entrant fold(s) and lacking large, transverse, isolated enamel lakes.
         5. Course of upper incisors readily traced on surface of rostrum; M3 with two inner and two outer re-entrant folds; infraorbital canal with conspicuous accessory canal for transmission of nerve. . . . . *Boromys*, p. 804
         5′. Course of upper incisors not readily traced on surface of rostrum; M3 with one inner and one outer re-entrant fold; infraorbital canal lacking accessory canal for transmission of nerve. *Brotomys*, p. 804

1′. Not occurring on Antillean islands.
   6. Both upper and lower cheek-teeth with strong tendency to formation of series of transverse laminae; pelage harsh but not spiny. . . . . *Diplomys*, p. 802
   6′. Upper and lower cheek-teeth lacking tendency toward formation of series of transverse laminae; pelage spiny.
      7. Pelage excessively spiny; upper cheek-teeth with four clearly marked outer re-entrant folds. *Hoplomys*, p. 800
      7′. Pelage moderately spiny; upper cheek-teeth usually with three or less outer re-entrant folds. *Proechimys*, p. 800

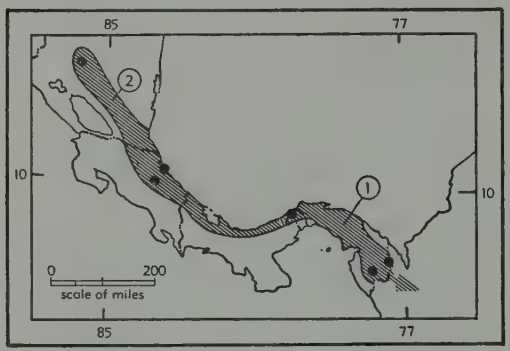
SUBFAMILY ECHIMYINAE

Genus Hoplomys J. A. Allen—Armored Rat

1908. *Hoplomys* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:649, October 13. Type, *Hoplomys truei* J. A. Allen.

Resembling *Proechimys*, especially externally. Cheek-teeth with 4 transverse furrows, the maxillary series being more obliquely arranged than in *Proechimys*. Spines well developed, possibly maximum for the family; fur coarse; tail shorter than head and body, nearly naked. Attains a head-body length of approximately 400.

The genus is monotypic.



Map 440. *Hoplomys gymnurus*.

1. *H. g. goethalsi* 2. *H. g. truei*

Hopolomys gymnurus
Armored Rat

The type, an adult male, of *H. g. truei*, measures: Length of head and body, 380; tail, 170; hind foot (dry), 53. Upper parts blackish underlaid with pale to grayish brown, palest on sides; underparts white or nearly so; ears nearly naked, dark brown to black; tail naked, scaly, brownish above, whitish below.

Hoplomys gymnurus goethalsi Goldman

1912. *Hoplomys goethalsi* Goldman, Smiths. Miscl. Coll., 56 (36):10, February 19, type from Río Indio, near Gatún, Canal Zone, Panamá.

1920. *Hoplomys gymnurus goethalsi*, Goldman, Smiths. Miscl. Coll., 69(5):123, April 24.

MARGINAL RECORDS.—Panamá (Goldman, 1920:124): Gatún; Tacarcuna; Cana.

Hoplomys gymnurus truei J. A. Allen

1908. *Hoplomys truei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:650, October 13, type from Lavala [= Savala], Matagalpa, Nicaragua.

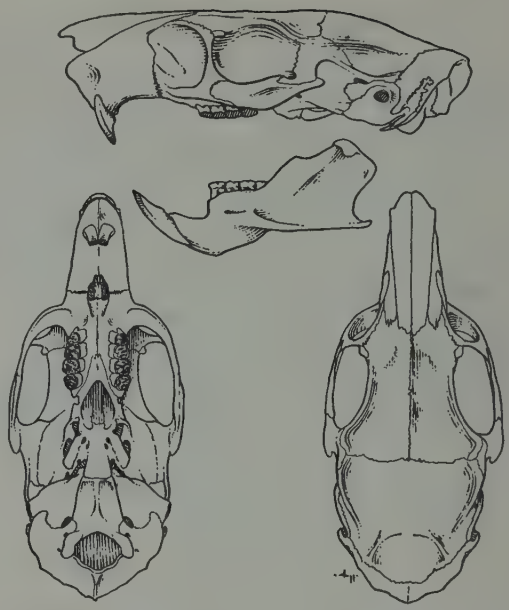


Fig. 436. *Hoplomys gymnurus goethalsi*, Cana, Panamá, No. 179035 U.S.N.M., ♂, X 1.

1920. *Hoplomys gymnurus truei*, Goldman, Smiths. Miscl. Coll., 69(5):124, April 24.

MARGINAL RECORDS.—Nicaragua: type locality. Costa Rica (Goodwin, 1946:423): Suerre; Santa Teresa Perálta.

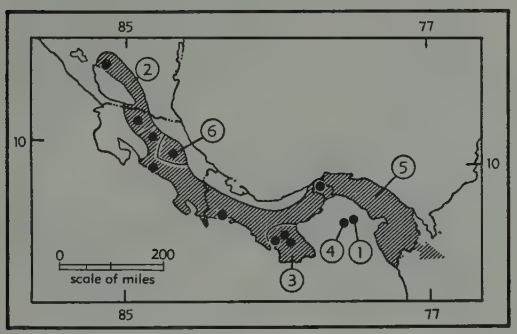
Genus Proechimys J. A. Allen—Spiny Rats

1899. *Proechimys* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 12:264, December 26. Type, *Echimys trinitatis* J. A. Allen and Chapman.

Length of head and body, 165–290; tail, 121–242; hind foot, 35–57; ear, 17–29. "Muriform echimyids of medium size; pelage with flattened and lanceolate and sometimes clavate aristiforms, varying greatly in width and distributed over most of the dorsal surface from shoulders to hips or base of tail . . . [skull usually] elongate and strongly built, with supraorbital ridges well developed, frequently extending across parietals toward occipital region; zygomatic arches . . . always with postorbital process; . . . mesopterygoid fossa extending forward at least to plane of third molars; . . . upper molariform teeth with a main internal fold and one to five external counterfolds which usually appear as enamel islands in worn teeth, these counterfolds barely implicating the lateral wall; lower molariform teeth with folds as in the

upper molariform teeth except that they are reversed and the number of internal counterfolds is usually fewer in the molars" (Moojen, 1948:333).

Only one species, *P. semispinosus*, occurs within the geographic scope of this work.



Map 441. *Proechimys semispinosus*.

1. *P. s. burrus*
2. *P. s. centralis*
3. *P. s. goldmani*
4. *P. s. ignotus*
5. *P. s. panamensis*
6. *P. s. rubellus*

Proechimys semispinosus
Tomes' Spiny Rat

Size large; tail short and hairy; aristiforms wide and stiff, especially well developed on back; general color on upper parts some shade of ochraceous, usually much darker on back and forming a conspicuous dorsal band; feet dark; ventral surfaces and inner sides of legs white; skull elongate and strong with ridges well developed; incisive foramina long and narrow; bullae large; usually 4 counterfolds in M3 and M2; usually 3 but sometimes 4 counterfolds in M1 and even P4; lower premolar with 4, and lower molars with 3, counterfolds.

These animals occur in a variety of habitats throughout their geographic range, but are generally absent from the higher altitudes. Usually 2 to 3 young comprise a litter. As is fairly common among some groups of Central American and Antillean hystricomorphs, the tail is easily broken off; tailless individuals are common in nature, and seem to be at no particular disadvantage. Amputation occurs between the fifth and sixth caudal vertebrae.

Proechimys semispinosus burrus Bangs

1901. *Proechimys burrus* Bangs, Amer. Nat., 35:640, August, type from San Miguel Island, Golfo de Panamá, Panamá. Known only from the type locality.

1920. *Proechimys semispinosus burrus*, Goldman, Smiths. Miscl. Coll., 69(5):120, April 24.

Proechimys semispinosus centralis (Thomas)

1889. *Echinomys semispinosus* True, Proc. U.S. Nat. Mus., 11:467, September 3, type from San Emilio, Lake Nicaragua, Nicaragua. Not *Echimys semispinosus* Tomes, 1860, from Gualaquiza, Ecuador.

1896. *Echinomys centralis* Thomas, Ann. Mag. Nat. Hist., ser. 6, 18:312, October, a renaming of *E. semispinosus* True.

1920. *Proechimys semispinosus centralis*, Goldman, Smiths. Miscl. Coll., 69(5):120, April 24.

MARGINAL RECORDS.—Nicaragua: type locality. Costa Rica: Vijagual San Carlos (Goodwin, 1946:421).

Proechimys semispinosus goldmani Bole

1937. *Proechimys semispinosus goldmani* Bole, Sci. Publ. Cleveland Mus. Nat. Hist., 7:178, August 31, type from Altos Cacao, on ridge between Río Mariato and Río Negro, Mariato-Suay Lands, Veraguas, Panamá.

MARGINAL RECORDS.—Panamá (Bole, 1937:181): Mariato Rubber Camp; type locality; *Cerro Viejo*; Paracoté.

Proechimys semispinosus ignotus R. Kellogg

1946. *Proechimys semispinosus ignotus* R. Kellogg, Proc. Biol. Soc. Washington, 59:61, March 11, type from San José Island, Golfo de Panamá, Panamá. Known only from the type locality.

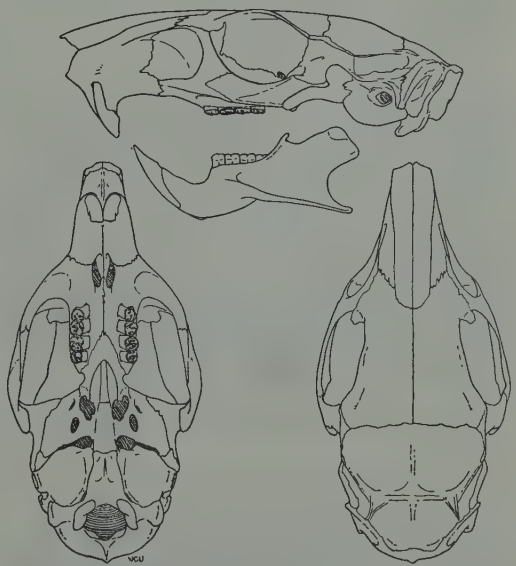


Fig. 437. *Proechimys semispinosus panamensis*, Vijagual, 37 km. N Quepos, 600 meters, Costa Rica, No. 39251 K.U., ♂, X 1.

Proechimys semispinosus panamensis Thomas

1900. *Proechimys centralis panamensis* Thomas, Ann. Mag. Nat. Hist., ser. 7, 5:220, February, type from savanna of Panamá, near City of Panamá, Panamá.
1920. *Proechimys semispinosus panamensis*, Goldman, Smiths. Miscl. Coll., 69(5):120, April 24.
1900. *Proechimys centralis chiriquinus* Thomas, Ann. Mag. Nat. Hist., ser. 7, 5:220, February, type from Bogava [= Bugaba], 800 ft., Chiriquí, Panamá.

MARGINAL RECORDS.—Costa Rica: Vijagual (39251 KU); San Gerónimo Pirris (Goodwin, 1946:421). Panamá: Bugaba [= Bogava] (Goldman, 1920:120); Barro Colorado Island, C. Z. (Enders, 1930:286), thence southward through Darién Province into South America.

Proechimys semispinosus rubellus Hollister

1914. *Proechimys rubellus* Hollister, Proc. Biol. Soc. Washington, 27:57, March 20, type from Angostura Valley, Cartago, Costa Rica. Known only from the type locality.
1920. *Proechimys semispinosus rubellus*, Goldman, Smiths. Miscl. Coll., 69(5):120, April 24.

Genus Echimys F. Cuvier—Spiny Rats

1809. *Echimys* F. Cuvier, Nouv. Bull. Soc. Philom., Paris, 24:394, September. Type by subsequent selection (see Tate, Bull. Amer. Mus. Nat. Hist., 68:429–431, June 12, 1935), *Myoxus chrysurus* Zimmermann, 1780.
1811. *Loncheres* Illiger, Prodromus systematis mammalium et avium . . . , p. 90. Type by monotypy, *Myoxus chrysurus* Zimmermann.
1837. *Nelomys* F. Cuvier, Ann. Sci. Nat., Paris, ser. 2, 8:370. Type, *Nelomys blainvillei* F. Cuvier, 1837.
1840. *Echinomys* Wagner, Abhand. Bayer. Akad., 3:203, an emendation of *Echimys* F. Cuvier.

Feet broad, modified for arboreal or scansorial life, claws prominent; pelage spiny but variable in degree; tail shorter or longer than head and body, naked or hairy. Skull robust, conspicuously ridged; infraorbital canal lacking accessory canal for transmission of nerve; palatal foramina short; cheek-teeth complex, the upper series showing a strong tendency to form a series of transverse plates and usually with 2 outer and 2 inner folds above, and "one outer and two inner folds [below] except the premolar, a complex tooth with three or sometimes four inner folds" (Ellerman, 1940:109).

Only one species, *E. armatus*, of this poorly known genus occurs within the geographic scope of this work.

Echimys armatus
Guianan Spiny Rat

Upper cheek-teeth usually not separated into transverse plates; tail naked; spinescense strongly developed. The trinomen is employed here because *Echimys occasius* from Ecuador and Columbia has been placed as a subspecies of *E. armatus*.

Echimys armatus armatus (I. Geoffroy St.-Hilaire)

1830. *Mus hispidus* Lichtenstein, Darstellung neue . . . Säugethiere, pl. 35, fig. 1 and pl. 36, with text, type from Cayenne, French Guiana. Not *Echimys hispidus* Desmarest, 1817 [= *Mesomys hispidus*], type from South America.
1838. *Nelomys armatus* I. Geoffroy St.-Hilaire, Ann. Sci. Nat., Paris, ser. 2, 10:125, a renaming of *Mus hispidus* Lichtenstein.
1904. [*Echimys*] *armatus*, Trouessart, Catalogus mammalium . . . Suppl., fasc. 2, p. 503.
1888. *Loncheres guianae* Thomas, Ann. Mag. Nat. Hist., ser. 6, 2:326, type from British Guiana.
1893. *Loncheres castaneus* J. A. Allen and Chapman, Bull. Amer. Mus. Nat. Hist., 5:222, type from Princetown, Trinidad.

MARGINAL RECORDS.—Known, within the regions here considered, only from Martinique (Miller, 1924:440). Not mapped.

Genus Diplomys Thomas—Spiny Rats

1916. *Diplomys* Thomas, Ann. Mag. Nat. Hist., ser. 8, 18: 240, August. Type, *Loncheres caniceps* Günther, 1876.

In general like *Echimys*, but lower cheek-teeth in a series of transverse plates; same is true of upper teeth; 4 laminae in each upper tooth; 4 in p4, 3 in each lower molar (after Ellerman, 1940:115). Goldman (1920:124) states that this genus, as represented in Panamá, has short and conspicuously tufted ears. The pelage is spiny but much less so than in *Hoplomys* or *Proechimys*. Tail hairy; hind feet markedly broadened, adapted to arboreal habits.

KEY TO SPECIES OF DIPLOMYS

1. Feet silvery white; occurring on mainland. *D. darlingi*, p. 802
1′. Feet rusty reddish; occurring on San Miguel Island, Panamá. . . . . *D. labilis*, p. 803

Diplomys darlingi (Goldman)
Darling's Rat

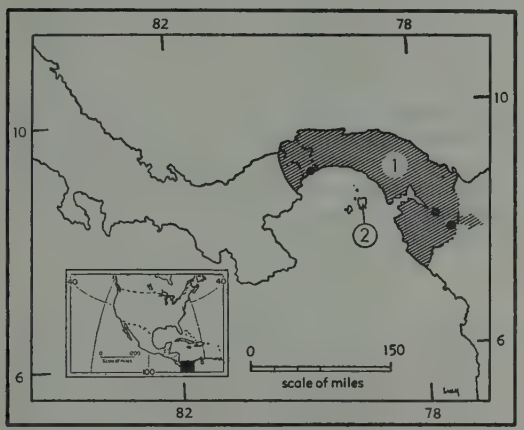
1912. *Isothrix darlingi* Goldman, Smiths. Miscl. Coll., 60(2): 12, September 20, type from Marraganti, near Real de Santa María, on the Río Tuyra, Panamá.
1916. *D*[*iplomys*]. *darlingi*, Thomas, Ann. Mag. Nat. Hist., ser. 8, 18:296, September.

External measurements of the type, a young female, are: 472, 240, 44. Upper parts ochraceous buff, darkened by black-tipped hairs middorsally; nose, lips, and muzzle mouse gray sharply interrupted at posterior base of vibrissae by a vertical white stripe; underparts ochraceous buff; feet

silvery white; tail unicolor, brownish, thinly haired and thinly tufted. Skull broader than that of *D. labilis*; auditory bullae larger; zygomata more widely spreading anteriorly.

This species is arboreal and diurnal.

MARGINAL RECORDS.—Panamá (Goldman, 1920:126): Ancón; type locality; Tapalisa.



Map 442. *Diplomys.*

1. *D. darlingi* 2. *D. labilis*

Diplomys labilis (Bangs)
Gliding Spiny Rat

1901. *Loncheres labilis* Bangs, Amer. Nat., 35:638, August 22, type from San Miguel Island, Golfo de Panamá, Panamá. Known only from the type locality.

1916. *D*[*iplomys*]. *labilis*, Thomas, Ann. Mag. Nat. Hist., ser. 8, 18:296, September.

External measurements of the type, an adult male, are: 540; 240; 47; 17. Pelage long, stiff, but without spines. Upper parts bright ferruginous, darkened middorsally (variable individually) by black-tipped hairs; yellowish-white patch at base of vibrissae, above eye, and behind ear; underparts varying from strong buff to clear ferruginous, sometimes both tones present in irregular patches; tail like upper parts basally, distally blackish, sometimes with thin whitish pencil; feet yellowish-brown.

Genus Heteropsomys Anthony

1916. *Heteropsomys* Anthony, Ann. New York Acad. Sci., 27:202, August 9. Type, *Heteropsomys insulans* Anthony.

1916. *Neopsomys* Miller, Smiths. Miscl. Coll., 16(12):2, December 7, an accidental renaming of *Heteropsomys* Anthony.

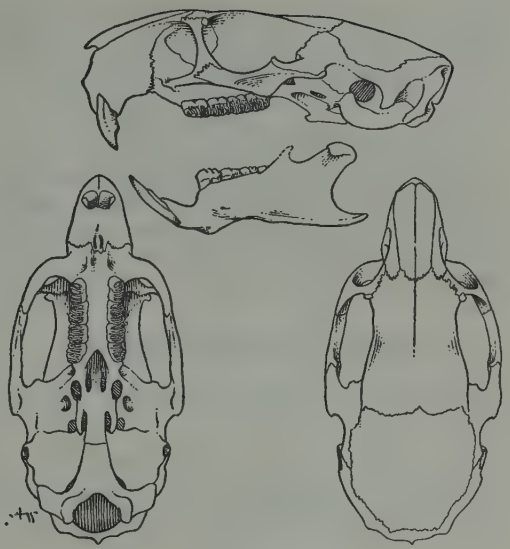


Fig. 438. *Diplomys labilis*, San Miguel Island, Panamá, No. 116667 U.S.N.M., ♂, X 1.

"Dorsal outline [of skull] gently curving from tip of nasals to parietal region, then abruptly curving downward; nasals unknown; ascending portion of premaxilla not reaching to nasal termination; lacrymal indicated as large; frontal with well developed postorbital process, interorbital constriction slight; parietals strongly convex; supra-occipitals with low, sharp, sagittal crest. . . . Infraorbital foramen of medium size. Palate short . . ." (Anthony, 1918:407–408). Upper incisors weak but long; upper cheek-teeth having 1 conspicuous internal fold and 3 separate transverse enamel-surrounded lakes; lower cheek-teeth having pattern of uppers reversed and but 2 lakes.

This genus is known only from parts of 2 skulls and 1 mandible. Anthony (1918:409) suggests that *Heteropsomys* is congeneric with *Homopsomys* but, owing to the lack of adequate material, the question of degree of relationship has never been satistorily resolved.

The genus is monotypic.

Heteropsomys insulans Anthony

1916. *Heteropsomys insulans* Anthony, Ann. New York Acad. Sci., 27:202, August 9, type from Cueva de la Ceiba, Hda. Jobo, near Utuado, Puerto Rico. Known only from the type locality. Not mapped.

For description see account of the genus.

Genus **Homopsomys** Anthony

1917. *Homopsomys* Anthony, Bull. Amer. Mus. Nat. Hist., 37:187, January 29. Type, *Homopsomys antillensis* Anthony. Known only from Puerto Rico. Not mapped.

Later regarded by Anthony (1918:409) as probably not distinct from *Heteropsomys*.

Closely resembling, so far as known, *Heteropsomys*; differing in heavier incisors; longer palate (postpalatal notch to incisive alveolus = 30.6 in a specimen of *Homopsomys* and 26 in the type of *Heteropsomys insulans*); but less convex frontals.

Homopsomys antillensis Anthony

1917. *Homopsomys antillensis* Anthony, Bull. Amer. Mus. Nat. Hist., 37:187, January 29, type from Utuado, Puerto Rico.

For description see account of the genus.

MARGINAL RECORDS.—Puerto Rico: type locality; Ciales (Anthony, 1918:408). Not mapped.

Genus **Brotomys** Miller

1916. *Brotomys* Miller, Smiths. Miscl. Coll., 66(12):6, December 7. Type, *Brotomys voratus* Miller.

Rostrum short, wide, deep; infraorbital canal especially large, lacking accessory canal for transmission of nerve; teeth weakly developed; toothrows approximately parallel, each tooth with 3 poorly developed roots; enamel pattern of P4 and M1 (much worn) with single re-entrant fold on each side (a tiny lake near inner tip of outer fold); tip of outer fold posterior to tip of inner fold. Distinguishable from *Heteropsomys* by relatively large antorbital foramina, horizontal anterior zygomatic roots, slightly emarginate palate, and perhaps more simplified enamel pattern (after Miller, 1916:6–7).

KEY TO NOMINAL SPECIES OF BROTOMYS

1. Frontopalatal depth less than 88 per cent of interorbital breadth. . . . *B. contractus*, p. 804
1′. Frontopalatal depth more than 88 per cent of interorbital breadth. . . . . *B. voratus*, p. 804

Brotomys voratus Miller

1916. *Brotomys voratus* Miller, Smiths. Miscl. Coll., 66(12):7, December 7, type from San Pedro de Macoris, Dominican Republic.

Selected measurements of the type are: palatal length, 25.4; palatilar length, 23.0; interorbital breadth, 14.6; least breadth of palate between premolars, 2.0; maxillary tooth-row (alveoli), 10.0.

MARGINAL RECORDS.—Dominican Republic, all in immediate vicinity of Samaná Bay (Miller, 1929c:6): type locality; Boca del Infierno; San Gabriel [Island]; [Río] Naranjo Abajo [= a key about ½ mi. E mouth]; Anadel; foothills SE Monte Cristi (Kilometer 2 site; Kilometer 4 site). Not mapped.

Brotomys (?) contractus Miller

1929. *Brotomys ? contractus* Miller, Smiths. Miscl. Coll., 81(9):13, March 30, type from small cave near St. Michel, Haiti. Known only from the type locality. Not mapped.

"Resembling *Brotomys voratus*, but size slightly less, rostrum relatively shorter, interorbital region narrower in proportion to frontopalatal depth and more arched transversely; teeth broader than in *Brotomys voratus*, and palate noticeably constricted, its interalveolar width at middle conspicuously less than transverse diameter of the adjoining alveoli" (Miller, 1929a:13).

Genus **Boromys** Miller

1916. *Boromys* Miller, Smiths. Miscl. Coll., 66(12):7, December 7. Type, *Boromys offella* Miller.

Resembling *Brotomys* but antorbital foramen with well-developed secondary groove for nerve; root of incisor producing evident swelling on side of maxillary above neural groove; cheek-teeth relatively larger, but of same form and root structure; enamel pattern of M3 (and probably of all other maxillary teeth) consisting of 2 narrow re-entrant folds from each side; extremities of all folds reaching about to median line of crown (after Miller, 1916:7).

KEY TO NOMINAL SPECIES OF BOROMYS

1. Alveolar length upper cheek-teeth more than 9.0. . . . . *B. offella*, p. 804
1′. Alveolar length upper cheek-teeth less than 9.0. . . . . *B. torrei*, p. 805

Boromys offella Miller

1916. *Boromys offella* Miller, Smiths. Miscl. Coll., 66(12):8, December 7, type from Maisí, Baracoa, Cuba.

Selected measurements of the type are: length from in front of incisor to posterior edge of alveolus of M3, 29.2; palatal breadth including alveoli of second molars, 9.0; least breadth of palate between premolars, 3.0; alveolar length maxillary cheek-teeth, 10.8.

MARGINAL RECORDS (Koopman and Ruibal, 1955:5).—Cuba: "State of Pinar Del Rio"; "State of" Las Villas; "State of" Camaguey (7 km. W Banao); "State of" Oriente (type locality); also Isla de Pinos. Not mapped.

Boromys torrei G. M. Allen

1917. *Boromys torrei* G. M. Allen, Bull. Mus. Comp. Zool., 61:6, January, type from cavern in the Sierra de Hato Nuevo, Matanzas, Cuba.

Resembles *B. offella* but differs in smaller size and deeper indentation of posterior margin of palate which reaches forward to level of center of M2. Selected measurements of the type are: palatal breadth including alveoli of M1, 6.4; palatal breadth including alveoli of M3, 6.5; alveolar length maxillary cheek-teeth, 7.6.

MARGINAL RECORDS (Koopman and Ruibal, 1955:5).—"States" as follow, all in Cuba: Pinar del Río; Matanzas (type locality); Las Villas; Camaguey (7 km. W Banao); Oriente; also Isla de Pinos. Not mapped.

Order CETACEA—Cetaceans

Fusiform; exclusively aquatic; thick, subcutaneous layer of blubber; sebaceous glands absent, sudiferous glands absent or reduced; anterior limbs paddle-shaped, not externally divided into segments; external hind limbs absent; pelvis vestigial, not in contact with vertebral column; tail flattened dorso-ventrally, laterally expanded into 2 pointed flukes; skin smooth, hairless except for bristles in region of mouth in some genera; pinnae absent, external auditory meatus vestigial and all but closed; external nares (single or paired) opening through aperture near crown of head; mammae a single pair, situated in depressions on either side of vulva; cervical vertebrae flattened and frequently fused; odontoid process of axis short and blunt; clavicles absent; sacrum absent, sacral vertebrae similar to adjacent lumbars and caudals; skull elongate anteriorly; braincase telescoped (except in fossil suborder Archaeoceti); teeth simplified or absent.

The characters in the keys, and diagnoses of cetaceans, have been drawn exclusively from the literature available to us and should be used with caution. The authority for North American ranges of cetaceans is Miller and Kellogg (1955:650–669) unless otherwise noted.

Suborder ODONTOCETI

Whale bone absent; teeth present; single narial opening; maxillae expanded and covering greater part of orbital processes of frontal bones; maxillae lacking orbital plates; nasal bones forming no part of root of narial passage, passage directed upwards and backwards.

Key to North American Families of Odontoceti

1. Tubercula of posterior ribs articulating with metapophyses; throat having external grooves.
   2. Narial opening median; functional teeth in mandible never more than 4. Ziphiidae, p. 806
   2′. Narial opening left of median line of skull; functional teeth in mandible 18 or more.
      3. Zygoma complete; dorsal fin small (see illustration). . Physeteridae, p. 812
      3′. Zygoma incomplete; dorsal fin well developed (see illustration). Kogiidae, p. 813

1′. Tubercula of posterior ribs articulating with diapophyses; throat lacking external grooves.
   4. Atlas and axis not fused; dorsal fin absent or rudimentary (see illustrations). Monodontidae, p. 814
   4′. Atlas and axis fused; dorsal fin well developed (except absent in *Lissodelphis*). Delphinidae, p. 815

Family ZIPHIIDAE—Beaked Whales

Revised by True, Bull. U. S. Nat. Mus., 73:1–89, 42 pls., September 28, 1910.

Total length to 42 feet; narial aperture median, half-moon shaped, directed forwards; external longitudinal grooves on throat divergent posteriorly, nearly meeting anteriorly; pectoral fins small, ovate, having 5 moderately well-developed digits; dorsal fin obtuse, usually falcate, situated posterior to middle of back. Skull with slender rostrum or beak; lacrimal bone distinct from jugal bone; bones of skull asymmetrical except in *Berardius*; tubercula of posterior ribs articulate with metapophyses; numerous vestigial teeth imbedded in gums of both upper and lower jaws; functional teeth confined to lower jaw in all North American species, never less than 2 nor more than 4; in females, teeth rarely above gum-line.

Key to Genera of Ziphiidae

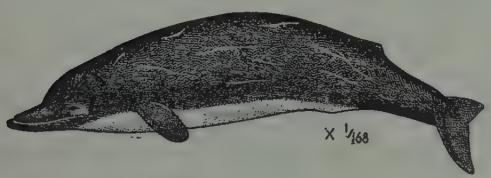
1. Four functional mandibular teeth; dorsal fin straight on posterior border. . *Berardius*, p. 807
1′. Functional mandibular teeth never more than 2; dorsal fin concave on posterior margin.
   2. All cervical vertebrae fused; prominent longitudinal maxillary crests anterior to external nares causing pronounced forehead in lateral external view. *Hyperoodon*, p. 811
   2′. Fusion of cervical vertebrae confined to no more than first 4; maxillary crests absent or, if present, small and lateral to external nares.
      3. Premaxillae ridged posteriorly, forming distinct cup around external nares; mouth small, reaching posteriorly less than halfway to level of eye. . . . . *Ziphius*, p. 809
      3′. Premaxillae flattened posteriorly, not forming cup around external nares; mouth large, reaching posteriorly nearly to level of eye. *Mesoplodon*, p. 807

Genus **Berardius** Duvernoy—Beaked Whales

1851. *Berardius* Duvernoy, Ann. Sci. Nat., Paris, ser. 3 (Zool.), 15:52. Type, *Berardius arnouxii* Duvernoy.

Total length to 42 ft., largest of beaked whales. Blackish dorsally, grayish to whitish ventrally. Four functional teeth in lower jaw, anterior pair the larger; skull symmetrical (asymmetrical in other genera of the family Ziphiidae); maxillae crested anterior to external nares but not so much as in *Hyperoodon*; nasal bones broad, massive and rounded; antorbital notch distinct; mesethmoid only partly ossified; 3 anterior cervical vertebrae fused; dorsal fin small, straight on posterior border.

Berardius bairdii Stejneger
Baird's Beaked Whale



1883. *Berardius bairdii* Stejneger, Proc. U. S. Nat. Mus., 6:75, June 30, type from Stare Gavan, Bering Island, Commander Islands, Bering Sea.

1883. *Berardius vegae* Malm, Bihang K. Svenska Vet. Akad. Handl., 8(4):109, type from Bering Island, Commander Islands, Bering Sea.

See characters of the genus.

The only other species of the genus, *B. arnouxii*, is known only from the waters of the Southern Hemisphere. Baird's beaked whale is said to travel frequently in gams of up to 20 individuals. Food is thought to consist mainly of cephalopods and fishes.

RANGE.—Pacific. Alaska: St. Matthew Islands, thence southward to California: Monterey Bay.

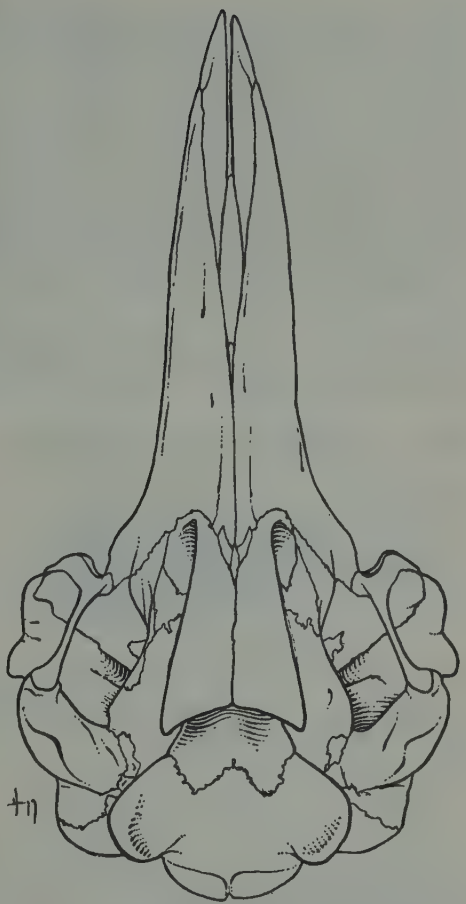


Fig. 439. *Berardius bairdii*, about 12½ mi. N Cape Mendocino, Humboldt Co., California, No. 49725 U.S.N.M., ♂ ?. Ventral view, X 1/10.

Genus **Mesoplodon** Gervais—Beaked Whales

1828. *Aodon* Lesson, Histoire Naturelle . . . des mammifères et des oiseaux découverts depuis 1788, cétacés, p. 155, 440, pl. 3, fig. 1. Type, *Aodon dalei* Lesson [= *Physeter bidens* Sowerby]. Not *Aodon* Lacépède, 1798, a fish.

1846. *Micropterus* Wagner, *in* Schreber, Die Säugthiere . . . , 7:281, 352, pl. 348. Type, *Delphinus micropterus* Cuvier [= *Physeter bidens* Sowerby]. Not *Micropterus* Lacépède, 1802, a fish.

1850. *Mesoplodon* Gervais, Ann. Sci. Nat., Paris, ser. 3 (Zool.), 14:16, July. Type, *Delphinus sowerbiensis* Blainville [= *Physeter bidens* Sowerby].

1850. *Dioplodon* Gervais, Compt. Rend. Acad. Sci. Paris, 31:512. Type, *Delphinus densirostris* Blainville. Valid as a subgenus according to Ellerman and Morrison-Scott, Checklist of Palaearctic and Indian mammals, 1758 to 1946, p. 724, November 19, 1951.

1851. *Mesodiodon* Duvernoy, Ann. Sci. Nat., Paris, ser. 3 (Zool.), 15:41, pl. 2, fig. 2, 2'. Type, *Dioplodon sowerbyt* Gervais [= *Physeter bidens* Sowerby].

1866. *Dolichodon* Gray, Catalogue of seals and whales in the British Museum, p. 353, fig. 72. Type, *Ziphius Layardii* Gray.

1871. *Callidon* Gray, Ann. Mag, Nat. Hist., ser. 4, 7:368, May. Type, *Mesoplodon güntheri* Krefft [= *Ziphius Layardii* Gray].

1871. *Neoziphius* Gray, Supplement . . . catalogue of seals and whales in the British Museum, p. 101. Type, *Dioplodon europaeus* Gervais [= *D. gervaisi* Deslongchamps].

1876. *Oulodon* von Haast, Proc. Zool. Soc. London, p. 457, October. Type, *Mesoplodon grayi* von Haast.

1922. *Paikea* Oliver, Proc. Zool. Soc. London, p. 574, September 28. Type, *Berardius hectori* Gray.

Total length to 22 ft. At most, a single pair of teeth in lower jaw project above gum-line [in some males additional teeth are buried in the gum tissue and in some females all teeth are buried in the gum tissue. The single pair of functional (visible) teeth in some species is anterior to the posterior margin of the mandibular symphysis and in other species is posterior to the symphysis.]; skull asymmetrical; maxillary tuberosities present or absent; nasal bones narrow; mesethmoid ossified in adults; rostrum long and narrow; anterior 2 or 3 cervical vertebrae fused; dorsal fin concave on posterior surface.

For diagnosis of American species of *Mesoplodon*, see especially Raven (1942), Orr (1953), and Moore and Wood (1957).

KEY TO NORTH AMERICAN SPECIES OF MESOPLODON

1. Functional teeth in lower jaw situated anterior to posterior margin of mandibular symphysis.
   2. Functional teeth in lower jaw situated at anterior tip of mandible; ventral outline of rostrum straight. . . . *M. mirus*, p. 809
   2′. Functional teeth in lower jaw situated immediately anterior to posterior margin of mandibular symphysis; ventral outline of rostrum concave distally, convex proximally. . . . . *M. gervaisi*, p. 808
1′. Functional teeth in lower jaw situated posterior to mandibular symphysis.
   3. Functional mandibular tooth small, height from alveolus never more than depth of mandible at shallowest place. *M. bidens*, p. 808
   3′. Functional mandibular tooth large, height from alveolus much more than depth of mandible at shallowest place.
      4. Mandible elongate, relatively slender; when inferior margin of mandible of lower jaw rests on a horizontal surface, rim of alveolus of the single tooth never higher than coronoid process; known from the Pacific. *M. stejnegeri*, p. 809
      4′. Mandible nearly rectangular posterior to mandibular symphysis; when inferior margin of mandible of lower jaw rests on a horizontal surface, rim of alveolus of the single tooth higher than coronoid process; known from the Atlantic. . . *M. densirostris*, p. 808

Mesoplodon bidens (Sowerby)
Sowerby's Beaked Whale

1804. *Physeter bidens* Sowerby, The British miscellany . . . , p. 1. Type locality, Coast of Elginshire, Scotland.

1878. *M[esoplodon]. bidens*, Flower, Proc. Zool. Soc. London, for 1877, p. 684, March.

1828. *Aodon dalei* Lesson, Histoire naturelle . . . des mammifères et des oiseaux découverts depuis 1788, cétacés, pl. 3. Type locality, North European waters.

1829. *Delphinus micropterus* G. Cuvier, Le règne animal . . . , 1:288. Type locality, coast of France.

Total length to 16 ft. Blackish to bluish-black dorsally and usually grayish or whitish ventrally. Teeth in lower jaw small, posterior to mandibular symphysis; premaxillary foramina anterior to maxillary foramina; rostrum broad at base, basirostral grooves absent; maxillary tuberosities absent.

Sowerby's beaked whale inhabits the North Atlantic Ocean and the species is especially well known from European coasts.

RANGE.—Atlantic. Known only from Massachusetts: Nantucket Island.

Mesoplodon densirostris (Blainville)
Atlantic Beaked Whale

1817. *Delphinus densirostris* Blainville, *in* Nouv. Dict. Hist. Nat. . . . , ed. 2, 9:178. Type locality, unknown.

1878. *M[esoplodon]. densirostris*, Flower, Proc. Zool. Soc. London, for 1877, p. 684, March.

Total length to approximately 15 ft. Adult male from Peggy's Cove, Nova Scotia, nearly completely black; some reddish patches on underside between flippers and about preputial opening and some irregular spots on belly may have been light gray, blue gray or white in life (after Raven, 1942:25). Weight of male mentioned above was 1783 lbs. Teeth in lower jaw large, located posterior to mandibular symphysis; lower jaw deeper medially than posteriorly, especially in males; rostrum narrow at base, basirostral grooves present; premaxillary foramina located posterior to maxillary foramina; maxillary tuberosities absent.

RANGE.—Atlantic. Nova Scotia: Peggy's Cove, approx. 30 mi. S Halifax, thence southward. Gunter's (1955:573) record from Texas (Padre Island, 40 mi. S Port Aransas) may be of some other species.

Mesoplodon gervaisi (Deslongchamps)
Gervais' Beaked Whale

1848–52. *Dioplodon europaeus* Gervais, Zoologie et paléontologie Francaises . . . , ed. 1, p. 4, a *nomen nudum*. Type locality, English Channel.

1866. *Dioplodon gervaisi* Deslongchamps, Bull. Soc. Linn. Normandie, 10:176, type from English Channel.

1951. *Mesoplodon gervaisi*, Ellerman and Morrison-Scott, Checklist of Palaearctic and Indian mammals, 1758 to 1946, British Museum, p. 725, November 19.

Total length to 16 ft. in the American specimens. Adult female from Rockaway Beach, Long Island,

New York (according to Raven, 1937:3), slaty black above, becoming somewhat lighter on sides and below. Teeth in lower jaw small, immediately anterior to posterior margin of mandibular symphysis; rostrum broad at base, basirostral grooves absent; premaxillary foramina anterior to maxillary foramina; ventral outline of rostrum straight.

RANGE (Moore and Wood, 1957:6).—Atlantic. New York: Rockaway Beach, Long Island, thence southward (Florida: Key Largo, Monroe Co.; Cuba: Cayo Alacranes; and Jamaica: Bull Bay).

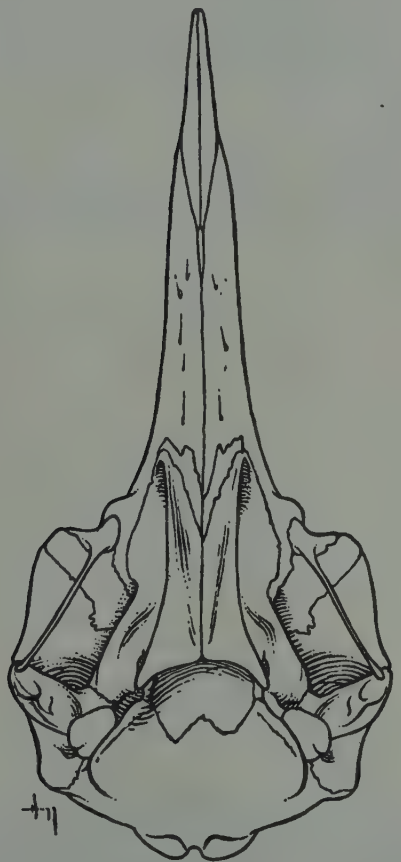


Fig. 440. *Mesoplodon gervaisi*, Atlantic City, New Jersey, No. 23346 U.S.N.M., yg. ♂. Ventral view, X ⅛.

Mesoplodon mirus True
True's Beaked Whale

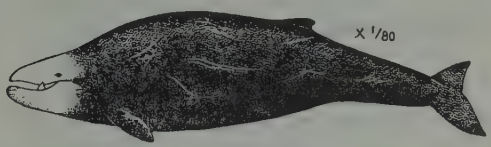
1913. *Mesoplodon mirum* True, Smiths. Miscl. Coll., 60(25): 1, March 14, type from Beauford Harbor, Carteret Co., North Carolina.

1919. *Mesoplodon mirus*, Harmer, Report on Cetacea stranded on the British coasts during 1918, British Mus., p. 18, March 22.

Total length to 17 ft. Type specimen, adult female (according to True, 1913:651): back, slate-black; lower sides, yellow-purple, flecked with black; median line of belly somewhat darker; a grayish area in front of vent; fins same color as back. Teeth in lower jaw small, situated at anterior tip of mandible; basirostral grooves absent; premaxillary foramina situated opposite, or slightly anterior to, maxillary foramina; ventral outline of rostrum concave distally, convex proximally.

RANGE.—Atlantic. Nova Scotia (Cape Breton Island): South Gut, St. Anne's Bay, thence southward to Florida: Flagler Beach (Moore and Wood, 1957:2).

Mesoplodon stejnegeri True
Stejneger's Beaked Whale



1885. *Mesoplodon Stejnegeri* True, Proc. U. S. Nat. Mus., 8:585, November 21, type from Bering Island, Commander Islands, Bering Sea.

1908. *Mesoplodon bowdoini* Andrews, Bull. Amer. Mus. Nat. Hist., 24:203, February 26, type from New Brighton Beach, Canterbury Province, New Zealand. Orr. (Jour. Mamm., 34:248, May 14, 1953) suggests that *bowdoini* is inseparable from *stejnegeri*.

Total length to 20 ft. Blackish throughout except for whitish on anterior part of head. Teeth in lower jaw large, situated posterior to mandibular symphysis; rostrum broad at base, basirostral grooves absent; maxillary tuberosities present; premaxillary foramina posterior to maxillary foramina.

RANGE (Orr, 1953:242).—Pacific. Type locality, thence southward to California: La Jolla.

Genus Ziphius G. Cuvier—Goose-beaked Whale

1814. *Epiodon* Rafinesque, Precis Découv. . . . Somiol. . . . , p. 13. Type, *Epiodon urganantus* Rafinesque, a *nomen dubium*.

1823. *Ziphius* G. Cuvier, Recherches sur les ossemens fossiles. . . . Type, *Ziphius cavirostris* G. Cuvier.

1846. *Xiphius* Agassiz, Nomenclator zoologici index universalis, p. 389, an emendation of *Ziphius*.

1864. *Aliama* Gray, Proc. Zool. Soc. London, p. 242, November. Type, *Delphinus Desmarestii* Risso [= *Ziphius cavirostris* G. Cuvier].

1865. *Petrorhynchus* Gray, Proc. Zool. Soc. London, p. 524, October. Type, *Hyperoodon capensis* Gray [= *Ziphius cavirostris* G. Cuvier].

1865. *Ziphiorrhynchus* Burmeister, Revista Farmacéutica, October (also Ann. Mag. Nat. Hist., ser. 3, 17:94, pl. 3, April, 1866). Type, *Ziphiorrhynchus cryptodon* Burmeister [= *Ziphius cavirostris* G. Cuvier].

Total length to 28 ft. Color variable, usually grayish throughout, darker above than below. Two functional teeth in lower jaw; first 3 or 4 cervical vertebrae fused; mesethmoid ossified; premaxillae massive posteriorly, forming distinct cup around external nares; skull asymmetrical; nasal bones obscuring part of external nares when skull viewed from above; antorbital notch indistinct; dorsal fin convex on posterior surface; mouth reaching posteriorly less than halfway to level of eye.

Goose-beaked whales are known from seas of both the Northern and Southern hemispheres. These whales frequently travel in gams of 30 to 40, swimming more or less in unison. Individuals sometimes remain under water one-half hour or more in search of food. They are thought to eat principally squid. The genus is monotypic.

Ziphius cavirostris G. Cuvier
Goose-beaked Whale

1814. *Epiodon urganantus* Rafinesque, Precis Découv. . . . Somiol. . . . , p. 13, a *nomen dubium*. Type locality, Sicily.

1823. *Ziphius cavirostris* G. Cuvier, Recherches sur les ossemens fossiles . . . , ed. 2, 5:352. Type locality, near Fos, Bouches-du-Rhone, France.

1826. *Delphinus Desmarestii* Risso, Hist. Nat. Anim. Europe Mérid., 3:24, pl. 3, fig. 3. Type locality, Mediterranean Sea.

1846. *Delphinus philippii* Cocco, Arch. f. Naturgesch., sect. 1, 12:104, pl. 4, fig. C. Type locality, Straits of Messina, Mediterranean Sea.

1850. *Hyperoodon doumetii* Gray, Catalogue . . . Mammalia in the . . . British Museum, Cetacea, p. 68. Type locality, Corsica.

1851. *Hyperoodon gervaisi* Duvernoy, Ann. Sci. Nat., Paris, ser. 3 (Zool.), 15:49, 67. Type locality, Coast of Aresquiers, near Frontignan, Dept. Hérault, France.

1864. *Ziphius indicus* van Beneden, Mém. Couronnés . . . Acad. Royal Sci. Lettres et Beaux-Arts Belgique, 16:23, pl. 1, June. Type locality, Cape of Good Hope, Union of South Africa.

1865. *Delphinorhynchus australis* Burmeister, Allgn. Zeitschr. Gesell. Naturw., Dresden, 26:262, August. Type locality, near Buenos Aires, Argentina.

1865. *Hyperoodon capensis* Gray, Proc. Zool. Soc. London, p. 359, October, type from Cape of Good Hope, Union of South Africa.

1865. *Ziphiorrhynchus cryptodon* Burmeister, Revista Farmacéutica, October (also Ann. Mag. Nat. Hist., ser. 3, 17:94, pl. 3, April, 1866). Type locality, Buenos Aires, Argentina.

1865. *Hyperondon* [*sic*] *semijunctus* Cope, Proc. Acad. Nat. Sci. Philadelphia, 17:280, December, type from Charleston, South Carolina.

1871. *Petrorhynchus mediterraneus* Gray, Supplement . . . catalogue of seals and whales in the British Museum, p. 98, type from Mediterranean Sea.

1873. *Epiodon chathamiensis* Hector, Trans. Proc. New Zealand Inst., 5:164, pls. 4–5, figs. a-b, May. Type locality, Chatham Islands, east of New Zealand.

1880. *Ziphius* (*Epiodon*) *novae-zealandiae* von Haast, Trans. Proc. New Zealand Inst., 12:241, pl. 8, May. Type locality, Lyttelton Harbor, New Zealand.

1883. *Ziphius grebnitzkii* Stejneger, Proc. U.S. Nat. Mus., 6:77, June 30, type from Bering Island, Commander Islands, Bering Sea.

See characters of the genus.

RANGE.—Atlantic. Rhode Island: Newport, thence southward to Florida: Conch Key, Monroe Co. (Moore, 1953: 149). Pacific. Alaska: Kiska Harbor, thence southward to California: Del Mar.

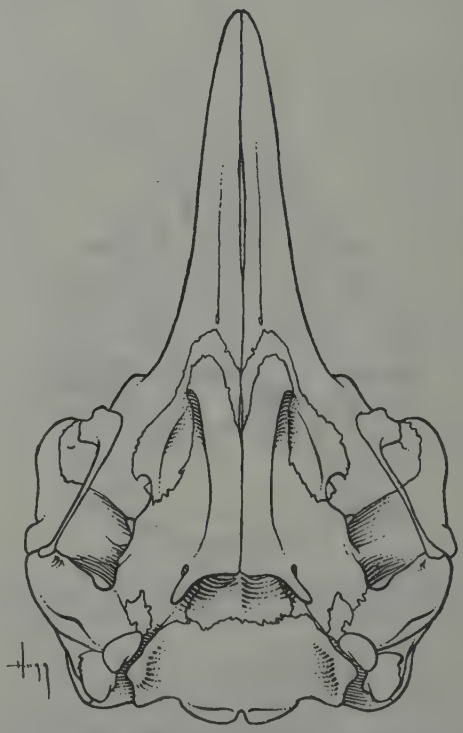


Fig. 441. *Ziphius cavirostris*, Newport, Rhode Island, No. 49599 U.S.N.M., ♂. Ventral view, X ¼.

Genus **Hyperoodon** Lacépède—Bottle-nosed Whales

1804. *Hyperoodon* Lacépède, Histoire naturelle des cétacées . . . , p. xliv, 319. Type, *Hyperoodon butskopf* Lacépède [= *Balaena ampullata* Forster].

1804. *Anarnak* Lacépède, Histoire naturelle des cétacées . . . , p. xxxviii, 164. Type, *Anarnak Groenlandicus* Lacépède, a *nomen dubium*.

1811. *Ancylodon* Illiger, Prodromus systematis mammalium et avium . . . , p. 143. Type, *Monodon Spurius* Fabricius [= *Balaena ampullata* Forster].

1811. *Uranodon* Illiger, Prodromus systematis mammalium et avium . . . , p. 143. Type, *Delphinus Butskopf* Bonnaterre [= *Balaena ampullata* Forster].

1825. *Ceto-diodon* Jacob, Dublin Philos. Jour. Sci. Review, 1:72, pl. [3], fig. 8, March. Type, *Ceto-diodon hunteri* Jacob [= *Balaena ampullata* Forster].

1830. *Nodus* Wagler, Natürliches System der Amphibien . . . , p. 34. Type, *Delphinus edentulus* Schreber [= *Balaena ampullata* Forster].

1843. *Chaenodelphinus* Eschricht, Förh. Skand. Naturf., p. 651. Type, *Balaena rostrata* Müller [= *Balaena ampullata* Forster].

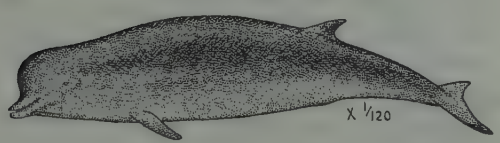
1846. *Chaenocetus* Eschricht, Overs. Dansk. Vidensk. Selsk. Fohr., Kjöbenhavn, for 1845, p. 17. Type, The "Naebhvae" or *Balaena ampullata* Forster.

1863. *Lagenocetus* Gray, Proc. Zool. Soc. London, p. 200, October. Type, *Lagenocetus latifrons* Gray [= *Balaena ampullata* Forster].

1866. *Lagocetus* Gray, Catalogue of seals and whales in the British Museum, ed. 2, p. 82, an emendation of *Lagenocetus* Gray.

Total length to 30 ft. Grayish-black dorsally, light gray to yellowish-gray ventrally. Single pair of small, functional teeth in lower jaw, situated at anterior tip of mandible; beak of skull with high crests formed by elevation of maxillary bones on either side of premaxillae anterior to external nares; mesethmoid not fully ossified; all cervical vertebrae fused; dorsal fin concave on posterior border; forehead high and beak distinct owing to high maxillary crest.

Hyperoodon ampullatus (Forster)
Bottle-nosed Whale



1770. *Balaena ampullata* Forster, *in* Kalm, Travels into North America . . . , 1:18, footnote. (Based on "beaked whale" of Pennant, The British Zoology, pt. 3, p. 43 [= p. 59, pl. 5, fig. 1], 1766.) Type locality, Maldon, Essex, England.

1902. *Hyperoodon ampullatus*, Rhoads, Science, n. s., 15: 756, May 9.

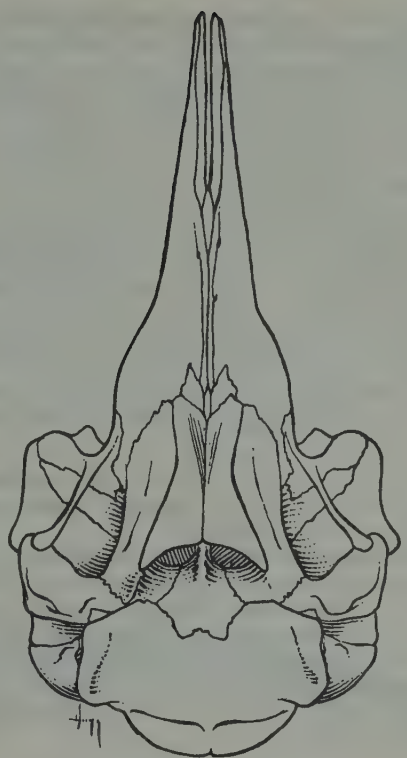


Fig. 442. *Hyperoodon ampullatus*, Norway, No. 14449 U.S.N.M., sex unknown. Ventral view, X approximately 1/6.

1776. *B*[*alaena*]. *rostrata* Müller, Zoologiae Danicae prodromus . . . , p. 7. Type locality, unknown.

1780. *Monodon Spurius* Fabricius, Fauna Groenlandica . . . , p. 31. Type locality, Greenland Seas.

1789. *D*[*elphinus*]. *bidentatus* Bonnaterre, Tabl. . . . des trois règnes de la nature, cétologie, p. 25, pl. 11, fig. 3. Type locality, River Thames, England.

1789. *D*[*elphinus*]. *Butskopf* Bonnaterre, Tabl. . . . des trois règnes de la nature, cétologie, p. 25. Type locality, Honfleur, France.

1802. *Delphinus edentulus* Schreber, Die Säugthiere . . . , 7:360. Type locality, North Atlantic.

1804. *Anarnak Groenlandicus* Lacépède, Histoire naturelle des cétacées . . . , p. 164, a *nomen dubium*. Type locality, Greenland Seas.

1804. *Delphinus diodon* Lacépède, Histoire naturelle des cétacées . . . , p. 309, pl. 13, fig. 3. Type locality, near London, England.

1807. *Delphinus bidens* Turton, British fauna . . . , p. 17. Type locality, unknown.

1812. *Delphinus coronatus* Frémenville, Bull. Soc. Philom., Paris, 3:71, a *nomen dubium*. Type locality, Spitzbergen.

1822. *Delphinus Hunteri* Demarest, Encyclopédie méthodique, mammalogie, 2:520. Type locality, River Thames, England.

1822. *Delphinus hyperoodon* Desmarest, Encyclopédie méthodique, mammalogie, 2:521. Type locality, near Honfleur, France.
1825. *Ceto-diodon hunteri* Jacob, Dublin Philos. Jour. Sci. Review, 1:72, pl. [3], fig. 8, March. Type locality, Killiney, near Dublin, Ireland.
1827. *Heterodon dalei* Lesson, Manuel de mammalogie . . . , p. 419. Type locality, Harwich, England, although Havre, France, also mentioned.
1828. *Hyperoodon bidens* Fleming, History of British animals, p. 36. Type locality, near Maldon, England.
1828. *Hyperoodon honfloriensis* Lesson, Histoire naturalle . . . des mammifères et des oiseaux découverts depuis 1788, cétacés, p. 137, 440. Type locality, Honfleur, France.
1846. *Hyperoodon latifrons* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1 (Mamm.): 27, pl. 4, type from Orkney Islands, Scotland.
1847. *Hyperoodon borealis* Nilsson, Skandinavisk fauna, 1 (Mamm.):622. Type locality, Iceland or Faeroe Islands or Greenland or Spitzbergen.

See characters of the genus. The only other species of the genus, *H. planifrons*, inhabits waters of the Southern Hemisphere.

Bottle-nosed whales have been sought in the past for oil and spermaceti by whalers in the North Atlantic. These whales frequently travel in gams of a dozen or more animals. Their food is thought to consist primarily of cephalopods and fishes. Calves are said to be approximately 10 ft. in length at birth. The weight of a 21-ft. female is recorded as 3800 lbs.

RANGE.—Atlantic. Franklin: Davis Strait, thence southward to Rhode Island: Narragansett Bay, near Tiverton.

FAMILY PHYSETERIDAE—Sperm Whale

Total length to 60 ft. (♂), 30 ft. (♀), largest of toothed whales. Snout high and blunt; head square in lateral view, approximately one-third total length of animal; mandible small and narrow; narial aperture left of median line of head; dorsal fin absent, replaced by median, longitudinal row of bumps on posterior half of back; pectoral appendages small; color dark bluish-gray, sometimes with whitish on venter and lower jaw; skull massive in proportion to post-cranial skeleton; facial depression greatly developed, obliterating longitudinal ridge behind nares; zygoma complete; brain small, situated far behind orbital region; each lower jaw with 20–25 teeth some of which may be 8 in. long; vestigial teeth in upper jaw.

Sperm whales have been arduously sought by whalers for several centuries, principally owing to the large amounts of spermaceti obtained from them. Most females and their calves inhabit tropical waters, whereas adult males travel to Arctic and Antarctic waters in summer. Food, in so far as known, consists primarily of squids and octopuses. Sperm whales are seemingly polygamous. Females give birth to 1 or 2 calves 13–14 ft. in length and suckle them for approximately 6 months. Calves are weaned when 21–22 ft. long. A 59-ft. male is recorded as weighing 52 tons. The family contains a single genus.

Genus Physeter Linnaeus—Sperm Whale

1758. *Physeter* Linnaeus, Syst. nat., ed. 10, 1:76. Type, *Physeter catodon* Linnaeus.
1761. *Catodon* Linnaeus, Fauna Suecica, ed. 2, p. 18. Type, *Physeter macrocephalus* Linnaeus [= *Physeter catodon* Linnaeus].
1804. *Physalus* Lacépède, Histoire naturelle des cétacées . . . , p. xl, 219. Type, *Physalus cylindricus* Lacépède [= *Physeter catodon* Linnaeus].
1865. *Meganeuron* Gray, Proc. Zool. Soc. London, p. 440, figs. 1 and 4, October. Type, *Catodon* (*Meganeuron*) *krefftii* Gray [= *Physeter catodon* Linnaeus].

See characters of the family. This genus is monotypic.

Physeter catodon Linnaeus
Sperm Whale

1758. [*Physeter*] *catodon* Linnaeus, Syst. nat., ed. 10, 1:76. Type locality, Kairston, Orkney Islands, Scotland (by restriction, Thomas, Proc. Zool. Soc. London, p. 157, March 22, 1911).
1758. [*Physeter*] *macrocephalus* Linnaeus, Syst. nat., ed. 10, 1:76. Type locality, "In Oceano Europaeo."
1758. [*Physeter*] *microps* Linnaeus, Syst. nat., ed. 10, 1:76. Type locality, "In Oceano septentrionali."
1758. [*Physeter*] *tursio* Linnaeus, Syst. nat., ed. 10, 1:77. Type locality, "In Oceano septentrionali."
1804. *Physalus cylindricus* Lacépède, Histoire naturelle des cétacées . . . , p. 219, pl. ix, fig. 3. Type locality, unknown.
1865. *Catodon* (*Meganeuron*) *krefftii* Gray, Proc. Zool. Soc. London, p. 440, figs. 1 and 4, October, type from Australian Seas.

See characters of the family.

RANGE.—Atlantic. Franklin: Davis Strait, thence southward to the Lesser Antilles and South American waters. Pacific. Alaska: Pribilof Islands, thence southward to Panamá: Golfo de Panamá and South American waters.

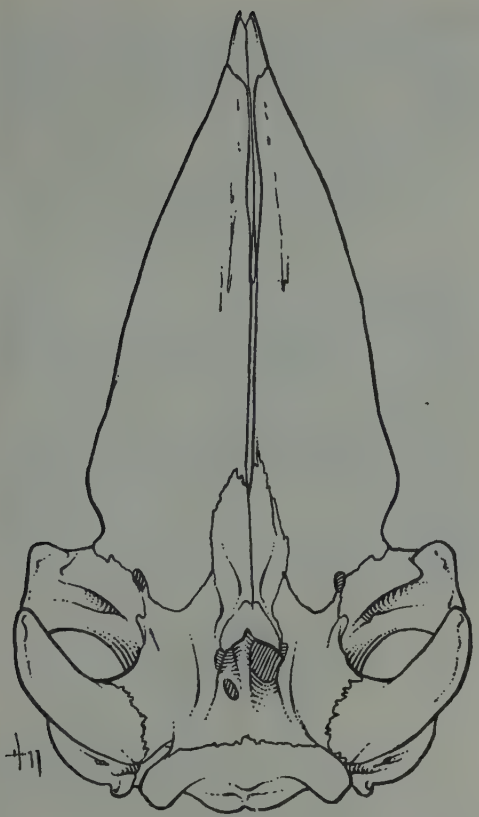


Fig. 443. *Physeter catodon,* outline from photograph by Stejneger of a skull from Bering Island. Details from skull from Kinkasan, Japan, No. 253051 U.S.N.M. Sex unknown. Ventral view, X approximately 1/25 (of No. 253051).

FAMILY KOGIIDAE—Pygmy Sperm Whale

Total length to 13 ft. Narial aperture left of median line of head; mandible small and narrow, not reaching anteriorly to level of bulbous, conical snout; dorsal fin falcate; pectoral appendages small; color blackish above, grayish to whitish on sides and below; rostrum short; sagittal crest well defined; anterior border of lateral crest of supercranial basin elevated outside of antorbital notches; lacrimal bones massive, fused with jugals; zygoma incomplete; palatine bones small; pterygoid bones expanded; facial depression moderately developed, distorting but not obliterating longitudinal ridge behind nares; brain relatively large, extending forwards to level of orbit; mandibular symphysis short; each lower jaw having 9–15 needlelike teeth.

Of two females, one beached on December 13 in Holland contained a fetus 8 in. long and the other on December 19 at Trivandrum Beach, India, had a 9 in. fetus. Two foods of this whale are shore crabs and squids. The family contains a single genus; there is a spermaceti reservoir as in the Physeteridae.

Genus **Kogia** Gray—Pygmy Sperm Whale

1846. *Kogia* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):22. Type, *Physeter breviceps* Blainville.

1851. *Euphysetes* Wall, Mem. Australian Mus., 1:46. Type, *Euphysetes grayii* Wall [= *Physeter breviceps* Blainville].

1871. *Callignathus* Gill, Amer. Nat., 4:737, 738, 740 (footnote), February. Type, *Physeter simus* Owen [= *Physeter breviceps* Blainville]. Not *Callignathus* Costa, 1853, a fish.

1876. *Cogia* Wallace, The geographical distribution of animals, 2:208, an emendation of *Kogia* Gray.

See characters of the family. This genus is monotypic.

Kogia breviceps (Blainville)
Pygmy Sperm Whale

1833. *Physeter breviceps* Blainville, Ann. Anat. Phys., 2: 337, pl. 10. Type locality, region of Cape of Good Hope, Union of South Africa.

1846. *Kogia breviceps,* Gray, in The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):22.

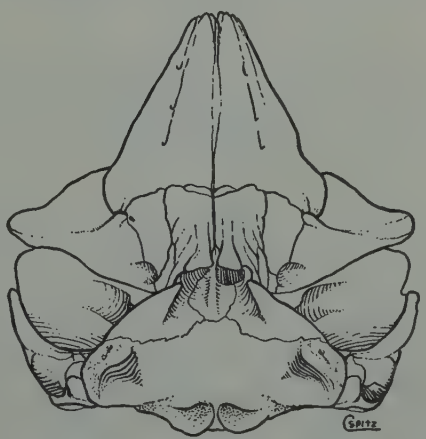


Fig. 444. *Kogia breviceps,* from Crescent Beach, St. Johns Co., Florida, No. 283625 U.S.N.M., ♀. Ventral view, X 1/4.

1851. *Euphysetes grayii* Wall, Mem. Australian Mus., 1:37, pl. 2. Type locality, Maroubra Beach, New South Wales, Australia.
1866. *Euphysetes macleayi* Krefft, Proc. Zool. Soc. London, for 1865, p. 713, figs. 1–6, April. Type locality, Manly Beach, New South Wales, Australia.
1866. *Physeter* (*Euphysetes*) *simus* Owen, Trans. Zool. Soc. London, 6:30, pls. 10–14, August 15, type from Waltair, Madras Presidency, India.
1871. *Kogia floweri* Gill, Amer. Nat., 4:738, February, type from near Mazatlán, Sinaloa.

See characters of the family.

RANGE.—Atlantic. Nova Scotia: Halifax Harbor, thence southward and westward to Texas: Padre Island (Gunter, *et al.*, 1955:263). Pacific. Washington: Grayland, thence southward to Sinaloa: near Mazatlán, thence southward into waters off west coast of South America.

FAMILY MONODONTIDAE—White Whale and Narwhal

Total length to 18 ft. Dorsal fin absent; pectoral appendages short and broad; snout blunt; throat lacking external grooves; external nares posterior to orbits; palatine bones participating in formation of posterior foramina of infraorbital canals; foramina of antorbital canals distinctly posterior to level of anterior border of orbits; cervical vertebrae unfused; 8 double-headed ribs, tubercula of posterior ribs articulating with diapophyses; teeth tusklike in manner of growth.

KEY TO GENERA OF MONODONTIDAE

1. Teeth never less than 32; color whitish throughout. . . . . *Delphinapterus*, p. 814
1′. Teeth never more than 2; color marbled grayish above, whitish below. . *Monodon*, p. 815

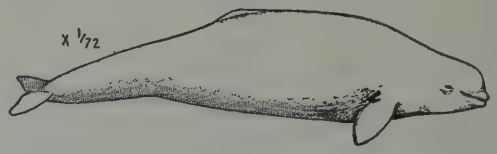
Genus Delphinapterus Lacépède—White Whale

1804. *Delphinapterus* Lacépède, Histoire naturelle des cétacées . . . , p. xli. Type, *Delphinapterus beluga* Lacépède [= *Delphinus leucas* Pallas].
1815. *Beluga* Rafinesque, Anal. Nat., p. 60, a renaming of *Delphinapterus* Lacépède.

Total length to 18 ft. Teeth $\frac{8}{8}$ to $\frac{10}{10}$, irregularly set in jaw; teeth implanted obliquely in alveoli and directed forwards in jaw; 9 lumbar vertebrae, 23 caudal vertebrae; premaxillae flat or slightly concave anterior to external nares; skull more or less symmetrical; posterior portion of pterygoid bones spreading laterally over alisphenoid bones; dorsal fin reduced to indistinct ridge; tail strongly furcate; external constriction between head and body; color whitish throughout except in young animals.

White whales have a circumpolar distribution in Arctic seas, seemingly prefer coastal waters and bays, have been known to travel considerable distances up fresh-water rivers, are gregarious (usually traveling in gams of 5–10), eat principally fishes, squids and prawns, and are hunted commercially for their hides and blubber. The genus, as here considered, is monotypic.

Delphinapterus leucas (Pallas) White Whale



1776. *Delphinus leucas* Pallas, . . . Reise durch verschiedene Provinzen des Russischen Reichs, 3(book 1):85, footnote. Type locality, mouth of Obi [Ob] River, northeastern Siberia, U.S.S.R.
1812. *D*[*elphinapterus*]. *leucas*, G. Cuvier, Ann. Mus. Hist. Nat. Paris, 19:13.
1822. *Delphinus canadensis* Desmarest, Encyclopédie méthodique, mammalogie, 2:516. Type locality, seas of Canada.

Fig. 445. *Delphinapterus leucas*, outline from No. 46 C.N.H.M., after Elliot (Field Columb. Mus., Zool. Ser., 2: pl. 5, 1901). Details from No. 238104 U.S.N.M., juv. ♀, from St. Lawrence River. Ventral view, X ¼.

1865. *Beluga rhinodon* Cope, Proc. Acad. Nat. Sci. Philadelphia, 17:278, type from Upernavik, Greenland.
1865. *Beluga declivis* Cope, Proc. Acad. Nat. Sci. Philadelphia, 17:278. Type locality unknown.
1865. *Beluga concreta* Cope, Proc. Acad. Nat. Sci. Philadelphia, 17:278. Type locality unknown.
1866. *Beluga angustata* Cope, Proc. Acad. Nat. Sci. Philadelphia, 18:293, type from Upernavik, Greenland.
1935. *Delphinapterus freimani* Klumov, Biulleten' rybnogo Khoziaistvo S.S.S.R. [Sea Fishery Economics in U.S.S.R.], Moscou, No. 7, pp. 26–28, fig. 2, type from White Sea, northeastern U.S.S.R.
1935. *Delphinapterus dorofeevi* Barabash and Klumov, Biulleten' rybnogo Khoziaistvo S.S.S.R. [Sea Fishery Economics in U.S.S.R.], Moscou, No. 11, p. 24, type from Okhotsk Sea. (Regarded as a subspecies of *D. leucas* by Ellerman and Morrison-Scott, Checklist of Palaearctic and Indian mammals, 1758 to 1946. British Museum, London, p. 727, November 19, 1951. Miller and Kellogg, Bull. U. S. Nat. Mus., 205:655, March 3, 1955, list *D. dorofeevi* as a species and state, "Presumably enters Bering Sea, and may represent forms recorded at Point Barrow. . . .")

See characters of the genus.

RANGE.—Arctic and subarctic seas north from Alaska: Cook Inlet, and north from Massachusetts: Cape Cod.

Genus **Monodon** Linnaeus—Narwhal

1758. *Monodon* Linnaeus, Syst. nat., ed. 10, 1:75. Type, *Monodon monoceros* Linnaeus.
1804. *Narwalus* Lacépède, Histoire naturelle des cétacées . . . , p. xxxvii. Type, *Narwalus vulgaris* Lacépède [= *Monodon monoceras* Linnaeus].

Total length to 12 ft., excluding tusk. Males with one canine tooth, usually the left, twisted anteriorly as long as 9 ft.; females usually not showing tusks externally; 6 lumbar and 26 caudal vertebrae; premaxillae convex anterior to external nares; skull asymmetrical; pterygoid bones small, not spreading laterally over alisphenoid bones; dorsal fin absent; tail only slightly furcate; color marbled grayish above, whitish below.

Narwhals have a circumpolar distribution in Arctic seas. During northward migrations in spring and southward migrations in fall they travel in large gams. Narwhals eat squids, fishes and crustaceans. Narwhals were formerly hunted commercially for their ivory and blubber.

Monodon monoceros Linnaeus
Narwhal

1758. [*Monodon*] *monoceros* Linnaeus, Syst. nat., ed. 10, 1:75. Type locality, Arctic seas.
1804. *Narwalus vulgaris* Lacépède, Histoire naturelle des cétacées . . . , p. xxxvii, 142. Type locality, unknown.
1804. *Narwalus microcephalus* Lacépède, Histoire naturelle des cétacées . . . , p. xxxviii, 159, pl. 9, fig. 1. Type locality, unknown.
1804. *Narwalus andersonianus* Lacépède, Histoire naturelle des cétacées . . . , p. xxxviii, 163. Type locality, unknown.

See characters of the genus.

RANGE.—Arctic seas northward from Alaska: Point Barrow (Bee and Hall, 1956:160), and northward from the coast of Labrador.

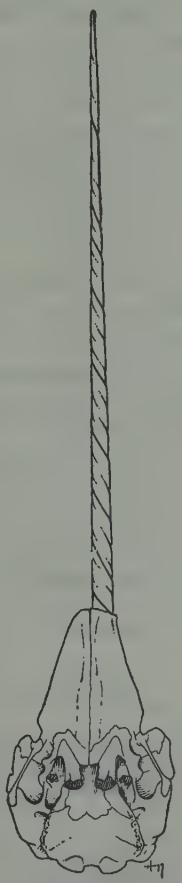


Fig. 446. *Monodon monoceros*, Holstenberg, Greenland, No. 2378 K. U., ♂. Ventral view, X 1/14.

FAMILY **DELPHINIDAE**—Porpoises and Dolphins

Revised by True, Bull. U.S. Nat. Mus., 36:1–191, 47 pls., August 8, 1889.

Total length to 30 ft. Tail notched posteromedially; pectoral appendage sickle-shaped; dorsal fin well developed (except absent in *Lissodelphis*).

Skull with rostrum approximately as long as, or even longer than, cranial portion of skull; rostrum not deepened or solidified; lacrimal bone indistinctly separated from jugal bone; pterygoid bones meeting medially or separate; anterior 2 cervical vertebrae fused; fewer than 8 double-headed ribs; tubercula of posterior ribs articulating with diapophyses; functional teeth numerous in both jaws.

KEY TO NORTH AMERICAN GENERA OF DELPHINIDAE

1. Distinctly beaked.
   2. Mandibular symphysis more than one-fourth length of ramus; crowns of teeth rugose. . *Steno*, p. 819
   2′. Mandibular symphysis approximately one-fifth length of ramus; crowns of teeth smooth or conical.
      3. Rostrum approximately same length as cranial portion of skull; usually 80 (74–92) or more vertebrae. . . . . *Lagenorhynchus*, p. 823
      3′. Rostrum longer than cranial portion of skull; never more than 76 vertebrae.
         4. Black ring around eye; palate having a deep lateral groove on each side. . . *Delphinus*, p. 820
         4′. Black ring around eye absent; palate lacking lateral grooves.
            5. Dorsal fin absent; pterygoid bones separate. . . . . *Lissodelphis*, p. 822
            5′. Dorsal fin present; pterygoid bones in contact.
               6. Teeth large, smooth, 19–26 in each tooth-row; 61–64 vertebrae. . . . *Tursiops*, p. 821
               6′. Teeth small, acute, 37–52 in each tooth-row; never less than 69 vertebrae. *Stenella*, p. 816
1′. Beak absent.
   7. Dorsal fin straight on posterior border; pectoral appendages large, ovate, rounded at distal end. *Grampus*, p. 824
   7′. Dorsal fin falcate or sickle-shaped on posterior border; pectoral appendages long, pointed.
      8. Pterygoid bones separate; most anterior point of lower jaw exceeding that of upper jaw.
         9. Approximately 95 vertebrae; white coloration limited to sides and venter posterior to pectoral appendages. . . . . *Phocoenoides*, p. 831
         9′. Approximately 65 vertebrae; venter white from region of chin to caudal fin. . *Phocoena*, p. 830
      8′. Pterygoid bones in contact; most anterior point of lower jaw not exceeding that of upper jaw.
         10. Anterior end of head rounded, not blunt; teeth in upper jaw not confined to anterior half of rostrum.
            11. Approximately 50 vertebrae; color blackish throughout. . . . . *Pseudorca*, p. 827
            11′. Approximately 67 vertebrae; color dark gray with white lip bands and white bands in anal region. . . . . *Feresa*, p. 830
         10′. Anterior end of head blunt with high forehead; teeth in upper jaw, if present, confined to anterior half of rostrum.
            12. Approximately 60 vertebrae; anterior part of head, excluding lower jaw, black. *Globicephala*, p. 827
            12′. Approximately 68 vertebrae; anterior part of head, including lower jaw, white. *Grampidelphis*, p. 826

Genus **Stenella** Gray—Porpoises

1864. *Clymene* Gray, Proc. Zool. Soc. London, p. 237, November. Type, *Delphinus euphrosyne* Gray [= *Delphinus styx* Gray]. Not *Clymene* Oken, 1815, a mollusk, nor Lamarck, 1818, a polychaete, nor Savigny, 1822, a polychaete.

1866. *Stenella* Gray, Proc. Zool. Soc. London, p. 213, September. Type, *Steno attenuatus* Gray.

1868. *Clymenia* Gray, Synopsis of the . . . whales and dolphins in the . . . British Museum, p. 6. No type species designated. Not *Clymenia* Munster, 1839, a mollusk.

1880. *Prodelphinus* Gervais, *in* van Beneden and Gervais, Ostéographie des cétacés . . . , p. 604. Type, *Delphinus marginatus* Duvernoy [= *Delphinus styx* Gray].

Total length to 8 ft. Beaked; rostrum long and narrow; rostral portion of intermaxillae convex; pterygoid bones in contact; lateral grooves on palate absent or rudimentary; mandibular symphysis less than one-fifth length of ramus; teeth small, acute, numerous (34–56 in each tooth-row); 68–81 vertebrae.

These porpoises frequently travel in schools of up to several hundred individuals. Both schools and individuals have been reported as following ships for hours, especially shrimping and fishing boats. Food consists primarily of fishes but squids are also eaten. Females are thought to bear a single calf. Adults of *S. plagiodon* are reported to weigh approximately 280 lbs.

KEY TO NORTH AMERICAN SPECIES OF STENELLA

1. Rostrum more than 60 per cent of total length of skull.
   2. Greatest width of skull less than 150; width of rostrum over posteriormost maxillary teeth less than 55. . *S. microps*, p. 818

2′. Greatest width of skull more than 150; width of rostrum over posteriormost maxillary teeth more than 55.
S. longirostris, p. 817

1′. Rostrum less than 60 per cent of total length of skull.

3. Narrow black bands from eye to anus and from eye to base of pectoral appendage.
S. styx, p. 818

3′. Narrow black bands from eye to anus and from eye to base of pectoral appendage lacking.

4. Maxillary teeth small, less than 3 mm. in width at alveoli; vertebrae, 79–81. . . . . *S. attenuata*, p. 817

4′. Maxillary teeth relatively large, more than 5 mm. in width at alveoli; vertebrae usually 70 or fewer.

5. General color-effect purplish-gray dorsally; greatest breadth of skull more than 192.
S. plagiodon, p. 818

5′. General color-effect blackish dorsally; greatest breadth of skull less than 192.

6. General color-effect blackish throughout; known from the Pacific. . . . *S. graffmani*, p. 817

6′. Ventral surface whitish; known from the Atlantic.
S. frontalis, p. 817

Stenella attenuata (Gray)
Slender-beaked Porpoise

1846. *Steno attenuatus* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):44. Type locality, unknown.
1934. *Stenella attenuata*, Iredale and Troughton, Mem. Australian Mus., 6:66, May 4.

Total length to 6 ft. Color blackish dorsally, ash-gray ventrally including pectoral appendages. Pectoral appendages large; rostrum less than twice length of cranial portion of skull; 35–44 teeth in each tooth-row; 79–81 vertebrae.

RANGE.—Known from Honolulu, Hawaii, may inhabit North American waters.

Stenella frontalis (G. Cuvier)
Cuvier's Porpoise

1829. *D[elphinus]. frontalis* G. Cuvier, Le règne animal . . . ; 1:288, April. Type locality, off Cape Verde Islands, North Atlantic Ocean.
1950. *Stenella frontalis*, Fraser, Atlantide Rept. No. 1 (Scientific results of the Danish expedition to the coasts of tropical West Africa (1945–1946), p. 61.
1836. *Delphinus fraenatus* F. Cuvier, Histoire naturelle des cétacés . . . , p. 155, pl. 10, fig. 1. Type locality, thirty leagues south of Cape Verde Islands, North Atlantic Ocean.
1846. *Delphinus doris* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):39, pl. 20. Type locality, unknown.
1850. *Delphinus clymene* Gray, Catalogue . . . Mammalia in the . . . British Museum, Cetacea, p. 115. Type locality, unknown.
1860. *Delphinus mediterraneus* Loche, Revue et Mag. Zool., Paris, ser. 2, 12:475, pl. 22, fig. 2. Type locality, coast of Algeria.
1866. *Delphinus normalis* Gray, Proc. Zool. Soc. London, p. 214, September. Type locality, unknown.

Total length to approximately 6 ft. Color blackish dorsally, shading to grayish laterally; whitish ventrally; sides mottled with blackish. Pectoral appendages small; rostrum less than twice length of cranial portion of skull; 35–44 (usually 37–38) teeth in each tooth-row; approximately 70 vertebrae.

RANGE.—Atlantic. North Carolina: Fort Macon, thence southward to South American waters.

Stenella graffmani (Lönnberg)
Graffman's Porpoise

1934. *Prodelphinus graffmani* Lönnberg, Arkiv för Zool., 26 A(19):1, April 24, type from off the beach approximately 20 mi. N Acapulco, Guerrero.
1940. *Stenella graffmani*, Kellogg, Nat. Geogr. Mag., 77(1): 85, January.

Total length to approximately 8 ft. Color blackish throughout, mottled dorsally with grayish-white. Pectoral appendages and dorsal fin small; rostrum less than twice length of cranial portion of skull; 43–47 teeth in each tooth-row.

RANGE.—Pacific. Type locality, thence southeastward to South American waters.

Stenella longirostris (Gray)
Long-beaked Porpoise

1828. *Delphinus longirostris* Gray, Spicilegia zoologica . . . , 1:1. Type locality, unknown (not Cape of Good Hope as ordinarily cited).
1934. *Stenella longirostris*, Iredale and Troughton, Mem. Australian Mus., 6:66, May 4.

Total length to approximately 7 ft. Color dark gray dorsally, mottled with light gray; white ventrally, blotched irregularly with grayish. Pectoral fins small; rostrum twice length of cranial portion of skull; palate with traces of lateral grooves; 46–56 (usually 50–52) teeth in each tooth-row; 72–73 vertebrae.

RANGE.—Pacific. Known only from between Panamá and Galapagos Islands (USNM 23302).

Stenella microps (Gray)
Small-headed Porpoise

1846. *Delphinus microps* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):42, pl. 25. Type locality, unknown.
1955. *Stenella microps*, Miller and Kellogg, Bull. U.S. Nat. Mus., 205:656, March 3.

Total length and color unknown. Pectoral appendages small; rostrum narrow, slightly less than twice length of cranial portion of skull; 51–55 teeth in each tooth-row.

RANGE.—Pacific. Known only from Nayarit: María Madre, Tres Marías Islands.

Stenella plagiodon (Cope)
Spotted Porpoise

1866. *Delphinus plagiodon* Cope, Proc. Acad. Nat. Sci. Philadelphia, 18:296. Type locality, unknown.
1940. *Stenella plagiodon*, Kellogg, Nat. Geogr. Mag., 77(1): 83, January.

Total length to 7 ft. Color purplish-gray dorsally, mottled with white or light gray, shading to grayish laterally; whitish ventrally, mottled with dark gray. Pectoral appendages large; rostrum less than twice length of cranial portion of skull; 34–37 teeth in each tooth-row; 68–69 vertebrae.

RANGE.—Atlantic. North Carolina: Cape Hatteras and Texas: channel in front of Port Aransas, thence southward to South American waters.

Stenella styx (Gray)
Gray's Porpoise

1846. *Delphinus styx* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):39, pl. 21. Type locality, west coast of Africa.
1951. *Stenella styx*, Ellerman and Morrison-Scott, Checklist of Palaearctic and Indian mammals, 1758 to 1946, p. 733, November 19.
1846. *Delphinus euphrosyne* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.): 40, pl. 22. Type locality, unknown. The specific name *euphrosyne* was used by True (Bull. U. S. Nat. Mus., 36:63, August 8, 1889) in preference to *styx* which has page priority.
1853. *Delphinus tethyos* Gervais, Bull. Soc. Agric. Hérault, 40:150, pl. 1, figs. 1–4. Type locality, mouth of Orb River, Hérault, France.
1856. *Delphinus marginatus* Duvernoy, *in* Pucheran, Revue et Mag. Zool., Paris, ser. 2, 8:545, pl. 25. Type locality, near Dieppe, France.
1866. *Tursio dorcides* Gray, Catalogue of seals and whales in the British Museum, p. 400. Type locality, unknown.
1866. *Clymene dorides* Gray, Proc. Zool. Soc. London, p. 214, September. Type locality, unknown.
1868. *Clymene similis* Gray, Proc. Zool. Soc. London, p. 146, fig. 2, May. Type locality, Cape of Good Hope, Union of South Africa.
1868. *Clymenia euphrosynoides* Gray, Synopsis of the . . . whales and dolphins in the . . . British Museum, p. 6. Type locality, unknown.

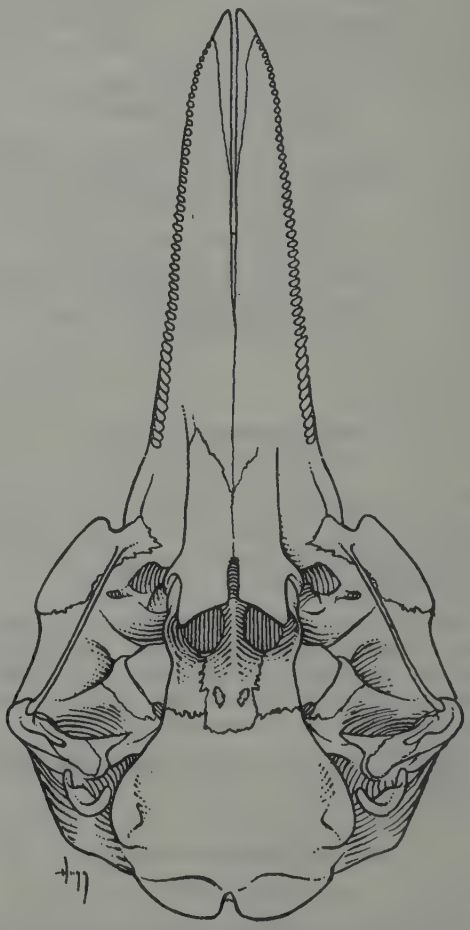


Fig. 447. *Stenella styx*, 5 mi. S Westport, Washington, No. 33133 U.S.N.M., sex unknown, after Kenyon and Scheffer (Jour. Mamm., 30:pl. 1, p. 268, August 17, 1949). Some details from No. 276066 U.S.N.M., sex unknown, from same locality. Ventral view, X ¼.

Total length to 8 ft. Color black dorsally, white ventrally; narrow black bands extending from eye to anus and from eye to base of pectoral appendage. Pectoral appendages small; rostrum less than twice length of cranial portion of skull; 44–50 teeth in each tooth-row; approximately 76 vertebrae.

RANGE.—Atlantic. South Greenland, thence southward to Jamaica. Pacific. Bering Sea, thence southward to Oregon: 10 mi. S mouth of Columbia River.

Genus **Steno** Gray—Rough-toothed Porpoise

1846. *Steno* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):43. Type, *Delphinus rostratus* Desmarest [= *Delphinus bredanensis* Lesson].

1936. *Stenopontistes* Miranda-Ribeiro, Bol. Mus. Nac., Rio de Janeiro, 12:19, 42, March. Type, *Stenopontistes zambezicus* Miranda-Ribeiro [= *Delphinus bredanensis* Lesson].

Total length to 8 ft. Color purplish-black dorsally, sides with yellowish-white spots; beak and ventral surface white, tinged with purple and rose color. Beaked, but beak not distinctly set off from "forehead"; rostrum long, narrow and compressed; mandibular symphysis one-fourth length of ramus; pterygoid bones in contact; postorbital processes of frontals slender; teeth large, crowns rugose, 20–27 in each tooth-row; 65–66 vertebrae.

Almost nothing is known of the life history of the rough-toothed porpoise. The genus *Steno* is monotypic.

Steno bredanensis (Lesson)
Rough-toothed Porpoise

1817. *Delphinus rostratus* Desmarest, *in* Nouv. Dict. Hist. Nat., ed. 2, 9:160. Type locality, Paimpol, France. Not *Delphinus rostratus* Shaw, 1801.

1823. [*Delphinus*] *frontatus* G. Cuvier, Recherches sur les ossemens fossiles . . . , ed. 2, 5:278, 400. (Part, see Flower, Proc. Zool. Soc. London, for 1883, pp. 482–483, April, 1884.) Type locality, Lisbon, Portugal.

1828. *Delphinus bredanensis* Lesson, Histoire naturelle . . . des mammifères et des oiseaux découverts depuis 1788, cétacés, p. 206. Type locality, European seas.

1955. *Steno bredanensis*, Ellerman and Morrison-Scott, Checklist of Palaearctic and Indian mammals, 1758 to 1946, p. 734, November 19.

1836. *Delphinorhynchus santonicus* Lesson, Histoire naturelle des mammifères . . . , p. 330. Type locality, Ile d'Aix, River Charente, France.

1841. *Delphinus reinwardtii* Schlegel, Abh. Gebiete Zool., 1:27, pl. 3, figs. 2–3. Type locality, Indian Archipelago.

1841. *Delphinus planiceps* Schlegel, Abh. Gebiete Zool., 1:27, pl. 4, fig. 8. Type locality, Dutch Coast.

1846. *Steno compressus* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):43, pl. 27. Type locality, South Sea, Antarctic expedition.

1936. *Stenopontistes zambezicus* Miranda-Ribeiro, Bol. Mus. Nac., Rio de Janeiro, 12:20, 42, March, type from Zambesi, southeastern Africa.

See characters of the genus.

RANGE.—Atlantic. Virginia: Norfolk (Handley and Patton, 1947:201), thence southward to South American waters. Pacific. Known only from California: Stinson Beach, Marin Co.

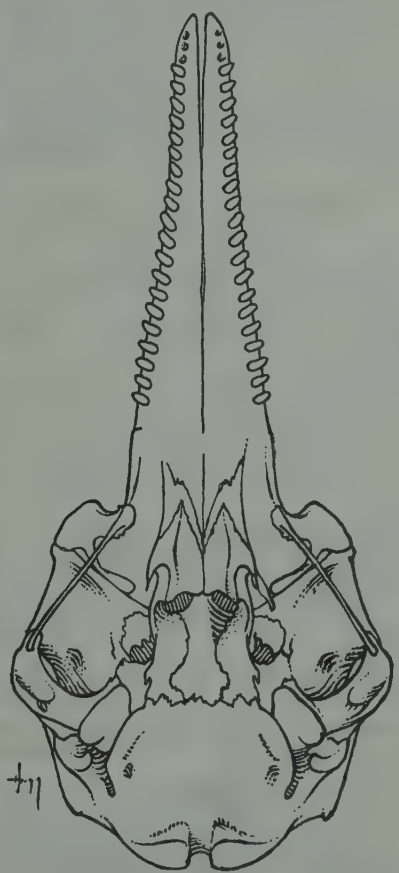


Fig. 448. *Steno bredanensis*, outline from a specimen received at Aburatsu, Kyushu (probably a whaling station), Japan, presumably from the North Pacific. After Ogawa (Studien über die Zahnwale in Japan. 4 Mitteilung. Botany and Zoology, theoretical and applied, Tokyo, vol. 4, No. 7 to vol. 5, No. 3, July 1936 to March 1937, fig. b of p. 1686). Details from No. 49628 U.S.N.M., sex unknown, from Tampa, Florida. Ventral view, X ¼.

Genus Delphinus Linnaeus—Dolphins

1758. *Delphinus* Linnaeus, Syst. nat., ed. 10, 1:77. Type, *Delphinus delphis* Linnaeus.

Total length to 8½ ft. Beaked; rostrum long and narrow; palate with 2 deep lateral grooves; pterygoid bones in contact; mandibular symphysis less than one-fifth length of ramus; black ring encircling eye; teeth small, acute, numerous (47–65 in each tooth-row); 73–76 vertebrae.

KEY TO NORTH AMERICAN SPECIES OF DELPHINUS

1. Ratio of rostral length to greatest diameter of skull across zygomatic processes of squamosals 1.53 or less; known from the Atlantic. *D. delphis*, p. 820
1′. Ratio of rostral length to greatest diameter of skull across zygomatic processes of squamosals 1.69 or more; known from the Pacific. *D. bairdii*, p. 821

Delphinus delphis Linnaeus
Atlantic Dolphin

1758. [*Delphinus*] *delphis* Linnaeus, Syst. nat., ed. 10, 1:77. Type locality, European seas.
1846. *Delphinus fulvafasciatus* Wagner *in* Schreber, Die Säugthiere . . . , Suppl., 7:pl. 361, fig. 1. Type locality, unknown.
1846. *Delphinus janira* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):41, pl. 23. Type locality, Newfoundland.
1846. *Delphinus forsteri* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):42, pl. 24. Type locality, between New Caledonia and Norfolk Island.
1848. *Delphinus albimanus* Peale, Mammalia and ornithology, *in* U. S. Expl. Exped. . . . , 1838–1842 . . . , Philadelphia, 8:33, pl. 7, fig. 1. Type locality, coast of Chile, lat. 27° 16′ S, long. 75° 30′ W.
1850. *Delphinus sao* Gray, Catalogue . . . Mammalia in the . . . British Museum, Cetacea, p. 125. Type locality, off Madagascar.
1860. *Delphinus algeriensis* Loche, Revue et Mag. Zool., Paris, 12:474, pl. 22, fig. 1. Type locality, Coast of Algeria.
1866. *Delphinus moorii* Gray, Proc. Zool. Soc. London, for 1865, p. 736, fig. 1, April. Type locality, South Atlantic, lat. 34° S, long. 7° 3′ W.
1866. *Delphinus walkeri* Gray, Proc. Zool. Soc. London, for 1865, p. 737, fig. 2, April. Type locality, South Atlantic, lat. 35° 38′ S, long. 0° 10′ E.
1866. *Delphinus pomeegra* Owen, Trans. Zool. Soc. London, 6:23, pl. 6, fig. 3, August 15. Type locality, off coast of Madras, India.
1866. *Delphinus major* Gray, Catalogue of seals and whales in the British Museum, p. 396. Type locality, unknown.
1868. *Delphinus marginatus* Lafont, Actes Soc. Linn. Bordeaux, 26:518. Type locality, Arcachon, France. Not Duvernoy, 1856.
1881. *Delphinus delphis souverbianus* Fischer, Actes Soc. Linn. Bordeaux, 35:127. Type locality, Arcachon, France.
1881. *Delphinus delphis variegatus* Fischer, Actes Soc. Linn. Bordeaux, 35:127. Type locality, Arcachon, France.
1881. *Delphinus delphis balteatus* Fischer, Actes Soc. Linn. Bordeaux, 35:127. Type locality, Arcachon, France.
1881. *Delphinus delphis moschatus* Fischer, Actes Soc. Linn. Bordeaux, 35:127. Type locality, Arcachon, France.
1883. *Delphinus delphis* var. *curvirostris* Riggio, Nat. Sicily, 2:158. Type locality, Mediterranean Sea.

Total length to 8 ft. Color blackish dorsally, including dorsal fin, flukes and dorsal surface of pectoral appendages; sides shading to grayish-green; mixed with elongated elliptical bands of whitish on flanks; whitish ventrally; whitish band over "forehead" with narrow black band in center that connects black eye-rings; black band from snout to leading edge of pectoral appendage frequently present. Rostrum not so slender as in *D. bairdii*; ratio of rostral length to greatest diameter of skull

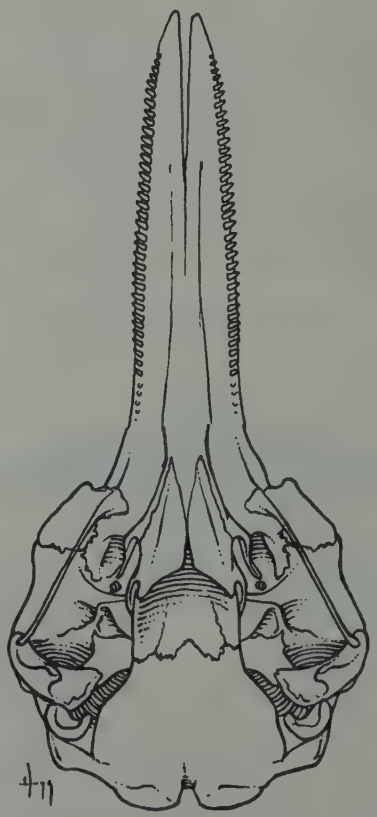


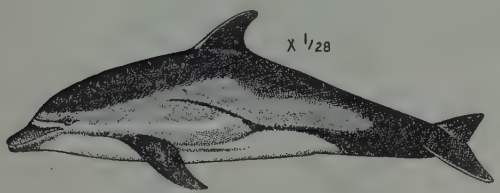
Fig. 449. *Delphinus delphis*, No. 44 C.N.H.M., after Elliot (Field Columb. Mus., Publ. 95, Zool. Ser., 4(1):pl. 24, 1904). Details from No. 21524 U.S.N.M., ♀, from Woods Hole, Massachusetts. Ventral view, X approximately ⅛.

across zygomatic processes of squamosals 1.53 or less.

Atlantic dolphins are exceptionally rapid swimmers, 18 knots per hour having been recorded for them. Food consists mainly of fishes, especially herring and pilchard. Calves are thought to be born in early summer. Atlantic dolphins, although primarily pelagic, occasionally ascend fresh-water rivers. In October, 1936, two animals were stranded 73 and 145 mi. respectively, up the Hudson River from New York City.

RANGE.—Atlantic. Massachusetts: Woods Hole, thence southward to the Caribbean Sea and South American waters.

Delphinus bairdii Dall
Pacific Dolphin



1873. *Delphinus bairdii* Dall, Proc. California Acad. Sci., 5:12, January 29, type from Cape [now Point] Arguello, Santa Barbara Co., California.

Total length to 7 ft. Color much as in *D. delphis* except flanks banded with golden, and a black band from snout to leading edge of pectoral appendage indistinct. Rostrum slender; ratio of rostral length to greatest diameter of skull across zygomatic processes of squamosals 1.69 or more.

RANGE.—British Columbia: Victoria (Guiguet, 1955: 136), thence southward to Baja California: Escondido Bay.

Genus **Tursiops** Gervais—Bottle-nosed Dolphins

Reviewed by True, Ann. Durban Mus., 1(1):10–24, June 1, 1914.

1843. *Tursio* Gray, List of . . . Mammalia in the . . . British Museum, pp. xxiii, 105, May 13. Type, *Delphinus truncatus* Montague. Not *Tursio* Wagler, 1830, nor *Tursio* Fleming, 1822.

1855. *Tursiops* Gervais, Histoire naturelle des mammifères . . . , 2:323. Type, *Delphinus truncatus* Montague, a renaming of *Tursio* Gray.

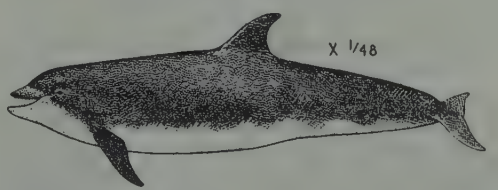
Total length to 12 ft. Rostrum long, tapering; vomer visible in median line of palate; pterygoid bones in contact; mandibular symphysis less than one-fifth length of ramus; postorbital process of frontal triangular; teeth large, smooth, 19–26 in each tooth-row; 61–64 vertebrae.

The following ecological comments are based principally on information available for *T. truncatus*. Bottle-nosed dolphins generally travel in schools of from 5 or 6 to several hundred individuals. Food consists primarily of fishes. These dolphins are migratory throughout the northern parts of their range. Males and females travel together in spring but the sexes are thought to live separately later in the year. A new born calf was stranded on the English coast in July. Calves have been reported from Florida in August and November. Pregnancy is thought to last from 10 months to a year. New born calves measure between 3 and 4 feet. The young of all delphinids, in so far as known, are born toothless. Female bottle-nosed dolphins swim behind their new born calves, pushing them to the surface so as to allow the calves to breathe. Several instances are on record in each of which a female bottle-nosed dolphin has supported a dead calf by means of her snout or back. A Floridan specimen of *T. truncatus* is recorded as weighing 148 kg.

KEY TO NORTH AMERICAN SPECIES OF TURSIOPS

1. Dorsal color slaty black; posterior end of vomer broad and triangular. . *T. nuuanu*, p. 822
1′. Dorsal color purplish-gray or gray-black; posterior end of vomer narrow and rectangular.
   2. Portion of parietal bone forming border of temporal fossa broad throughout; mandibular condyle less than one-half as long as height of mandible at coronoid process; known from the Atlantic. *T. truncatus*, p. 821
   2′. Portion of parietal bone forming border of temporal fossa distinctly narrowed ventrally; mandibular condyle one-half as long as height of mandible at coronoid process; known from the Pacific. *T. gillii*, p. 822

Tursiops truncatus (Montague)
Atlantic Bottle-nosed Dolphin



1821. *Delphinus truncatus* Montague, Mem. Wernerian Nat. Hist. Soc., 3:75, pl. 3. Type locality, Duncannon Pool, near Stoke Gabriel, approximately 5 mi. up River Dart, Devonshire, England.

1903. *Tursiops truncatus*, True, Proc. Acad. Nat. Sci. Philadelphia, 55:314, July 8.
1828. *Delphinus compressicauda* Lesson, Histoire naturelle . . . des mammifères et des oiseaux découverts depuis 1788, cétacés, p. 272. Type locality, Atlantic Ocean, near equator, lat. 04° S, long. 26° W.
1846. *Delphinus eurynome* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.): 38, pl. 17. Type locality, unknown.
1846. *Delphinus metis* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):38, pl. 18. Type locality, unknown.
1846. *Delphinus cymodoce* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):38, pl. 19. Type locality, unknown.

Total length to 12 ft. Color purplish-gray to clear gray dorsally, whitish ventrally; sides light gray. Posterior end of vomer narrow and rectangular; posterior margins of orbital plates of maxillae rounded; portion of parietal bone forming border of temporal fossa broad throughout; mandibular condyle less than one-half as long as height of mandible at coronoid process.

RANGE.—Atlantic. Massachusetts: Cape Cod (True, 1914: 15) and Texas: Aransas Pass, thence southward to South American waters.

Tursiops gillii Dall
Gill's Bottle-nosed Dolphin

1873. *Tursiops gillii* Dall, Proc. California Acad. Sci., 5:13, January 29, type from Monterey, California.

Total length to 12 ft. Color grayish-black dorsally, whitish ventrally. Posterior end of vomer narrow and rectangular; posterior margins of orbital plates of maxillae rounded; portion of parietal bone forming border of temporal fossa narrowed ventrally; mandibular condyle one-half as long as height of mandible at coronoid process.

RANGE.—Pacific. California: Monterey, thence southward to Baja California: San Bartolomé Bay. Known also from the Golfo de California from Sonora: Puerto Peñasco.

Tursiops nuuanu Andrews
Pacific Bottle-nosed Dolphin

1911. *Tursiops nuuanu* Andrews, Bull. Amer. Mus. Nat. Hist., 30:233, pl. 14, August 26, type from North Pacific Ocean, approximately lat. 12° N, long. 120° W.

Total length to approximately 7¼ ft. Color slaty-black dorsally, grayish ventrally. Posterior end of vomer broad and triangular; posterior margins of orbital plates of maxillae nearly straight; orbital plates not thickened over orbits; mandibular condyle small, much less than one-half as long as height of mandible at coronoid process.

RANGE.—Pacific. Baja California, Santa Catalina Island, Golfo de California, thence southward to Panamá: Pacific Ocean, 70 mi. S Panamá (Mayer, 1950:184).

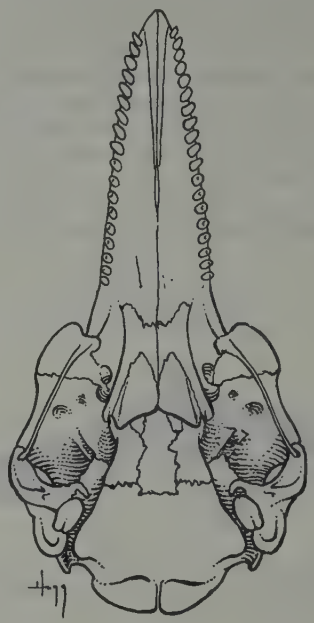


Fig. 450. *Tursiops nuuanu*, approximate locality, 12° N, 120° W, Pacific, No. 35045 A.M.N.H., after Andrews (Bull. Amer. Mus. Nat. Hist., 30:pl. 10, August 26, 1911). Details from No. 258642 U.S.N.M., ♂, from Charles Island, Post Office Bay, Galopagos Islands. Ventral view, X ⅛.

Genus Lissodelphis Gloger—Right-whale Dolphins

1841. *Lissodelphis* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, 1:169. Type, *Delphinus peronii* Lacépède.
1830. *Tursio* Wagler, Natürliches System des Amphibien . . . , p. 34. Type, *Delphinus peronii* Lacépède. Not *Tursio* Flemming, 1822.
1861. *Leucorhamphus* Lilljeborg, Upsala Univ. Arsskrift, 4:5. Type, *Delphinus peronii* Lacépède.

Total length to approximately 8 ft. Color black dorsally, whitish ventrally, well-defined border between dorsal and ventral colors. Beaked; rostrum long, broad, and tapering; rostral portion of intermaxillae flattened; pterygoid bones not in contact, their inner margins parallel; mandibular symphysis less than one-fifth length of ramus; teeth small, acute, numerous (43–45 in each tooth-row); dorsal fin absent; prominent caudal ridge.

A single species, *L. borealis*, is known from North American waters.

Lissodelphis borealis (Peale)
Northern Right-whale Dolphin

1848. *Delphinapterus borealis* Peale, Mammalia and ornithology, *in* U.S. Expl. Exped. . . . , 1838–1842 . . . , Philadelphia, 8:35. Type locality, North Pacific Ocean, lat. 46° 06′ 50″ N, long. 134° 05′ W, approximately 500 miles off mouth of Columbia River, Oregon.
1901. [*Lissodelphis*] *borealis*, Elliot, Field Columb. Mus., Publ. 45, Zool. Ser., 2:30, March 6.

See characters of the genus.

Right-whale dolphins frequently travel in small schools. Food consists primarily of fish and squid but pelagic barnacles are also eaten. A specimen from Washington weighed 124 lbs.

RANGE.—Pacific. Bering Sea, thence southward to California: San Diego Bay.

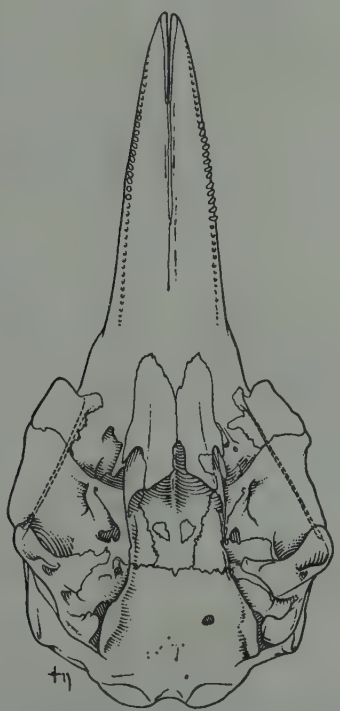


Fig. 451. *Lissodelphis borealis*, 100 mi. off Cape Mendocino, California, No. 8160 U.S.N.M., ♂. Ventral view, X ¼.

Genus Lagenorhynchus Gray—White-sided Dolphins

1846. *Lagenorhynchus* Gray, Ann. Mag. Nat. Hist., ser. 1, 17:84, February. Type, *Lagenorhynchus albirostris* Gray.
1866. *Electra* Gray, Catalogue of seals and whales in the British Museum, p. 268. Type, *Lagenorhynchus electra* Gray.
1866. *Leucopleurus* Gray, Proc. Zool. Soc. London, p. 216, September. Type, *Delphinus leucopleurus* Rasch [= *Delphinus acutus* Gray].

Total length to 10 ft. Beak short but distinct; rostrum broad, approximately as long as cranial portion of skull; rostral portion of premaxillae flat or slightly convex; pterygoid bones in contact or separate; mandibular symphysis less than one-fifth length of ramus; spines and transverse processes of vertebrae long and slender; teeth variable in size, 22–45 in each tooth-row; 73–92 vertebrae.

KEY TO NORTH AMERICAN SPECIES OF LAGENORHYNCHUS

1. 42–45 teeth in each tooth-row. *L. thicolea*, p. 824
1′. 37 teeth or less in each tooth-row.
  2. Interorbital breadth less than 200; 74 vertebrae; known from the Pacific. *L. obliquidens*, p. 824
  2′. Interorbital breadth more than 200; 78 or more vertebrae; known from the Atlantic.
    3. Black circle around eye; 88–92 vertebrae. . . . . *L. albirostris*, p. 823
    3′. Black circle around eye lacking; 78–82 vertebrae. . . . . *L. acutus*, p. 824

Lagenorhynchus albirostris Gray
White-beaked Dolphin

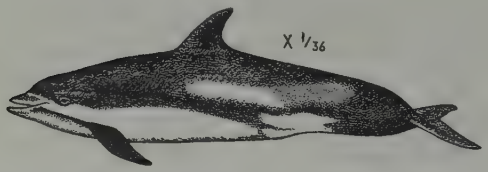
1846. *Lagenorhynchus albirostris* Gray, Ann. Mag. Nat. Hist., ser. 1, 17:84, February. Type locality, Great Yarmouth, England.

Total length to 10 ft. Color grayish-black dorsally, whitish ventrally; base of forehead, beak and mandible light gray; irregular whitish patches frequently on sides; whitish areas on dorsal median line posterior to nasal aperture and anterior to flukes. Premaxillae broad and flat, their outer margins convex; temporal fossae elliptical; pterygoid bones frequently in contact; 26–27 teeth in each tooth-row (usually only 22–25 erupted past gumline); 88–92 vertebrae.

White-beaked dolphins inhabit the colder, northern waters of the North Atlantic. Schools of as many as 1500 have been reported. Food is mainly various fishes and crustaceans. Calves are thought to be born in mid-summer.

RANGE.—Atlantic. Franklin: Davis Strait, and waters off western and southern Greenland.

Lagenorhynchus acutus (Gray)
Atlantic White-sided Dolphin



1828. *Delphinus* (*Grampus*) *acutus* Gray, Spicilegia zoologica . . . , 1:2. Type locality, unknown.

1846. *Lagenorhynchus acutus* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.): 36.

1841. *Delphinus eschrichtii* Schlegel, Abh. Gebiete Zool., 1:23, pls. 1 and 4. Type locality, Faeroe Islands, Great Britain.

1843. *Delphinus leucopleurus* Rasch, Nytt. Mag. Naturv., 4:100. Type locality, Gulf of Christiana, Norway.

1868. *Leucopleurus arcticus* Gray, Synopsis of the . . . whales and dolphins in the . . . British Museum, p. 7. Type locality, North Sea.

1876. *Lagenorhynchus perspicillatus* Cope, Proc. Acad. Nat. Sci. Philadelphia, 28:136, type from Woods Hole or Cape Cod, Massachusetts.

1876. *Lagenorhynchus gubernator* Cope, Proc. Acad. Nat. Sci. Philadelphia, 28:138, type from Casco Bay, near Portland, Maine.

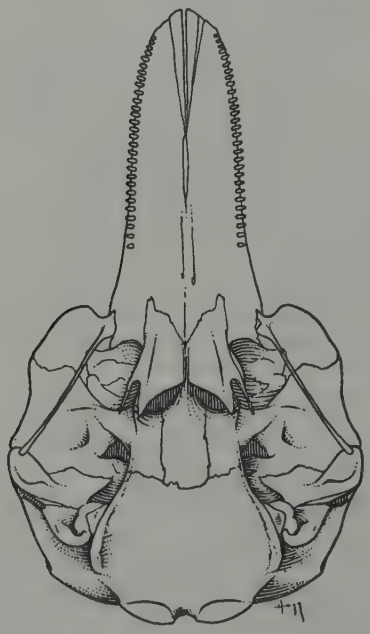


Fig. 452. *Lagenorhynchus acutus*, No. 45 C.N.H.M., after Elliot (Field Columb. Mus., Zool. Ser., 2:pl. 8, 1901). Ventral view, X 1/2.7.

Total length to 9 ft. Color grayish dorsally, whitish ventrally, yellowish on flanks; frequently a narrow black band from base of flukes along side to level of dorsal fin; black circle around eye. Premaxillae flat, their outer margins sinuate; temporal fossae elongate; pterygoid bones frequently in contact; 30–37 teeth in each tooth-row; 78–82 vertebrae.

Atlantic white-sided dolphins usually travel in schools, some schools containing more than 1000 individuals. Calves are thought to be born from spring to midsummer after a gestation period of approximately 10 months.

RANGE.—Atlantic. Southern Greenland, thence southward to Massachusetts: Cape Cod.

Lagenorhynchus obliquidens Gill
Pacific White-sided Dolphin

1865. *Lagenorhynchus obliquidens* Gill, Proc. Acad. Nat. Sci. Philadelphia, 17:177. Type locality, Pacific Ocean, near San Francisco, California.

Total length to approximately 7 ft. Color blackish dorsally, whitish ventrally, the 2 colors distinctly separated on sides. Premaxillae rounded, their outer margins weakly sinuate; temporal fossae large, rounded; pterygoid bones frequently separate; 29–31 teeth in each tooth-row; 74 vertebrae.

This species eats mainly fish and squid, is thought to mate in summer, and gives birth to young in the following spring or summer. A suckling young has been recorded for July off the coast of Washington. A pregnant female weighed 209 lbs.

RANGE.—Pacific. Alaska: Valdez (Swan Point), thence southward to Baja California: Ballenas Bay.

Lagenorhynchus thicolea Gray
Gray's White-sided Dolphin

1849. *Lagenorhynchus thicolea* Gray, Proc. Zool. Soc. London, p. 2, December 11. Type locality, western coast of North America.

Total length and color unknown. Premaxillae flat and narrow; temporal fossae small, rounded; rostrum approximately one-fifth longer than cranial portion of skull; 42–45 teeth in each tooth-row.

This species is known only from the skull of the type specimen.

Genus Grampus Gray—Killer Whales

1828. *Grampus* Gray, Spicilegia zoologica . . . , 1:2. Type by tautonomy, and subsequent selection (Gray, Zool. Jour., 4:497, 1829), *Delphinus grampus* "Linn." [= Hunter, 1787] = *Delphinus orca* Linnaeus.

1846. *Orca* Gray, Ann. Mag. Nat. Hist., ser. 1, 17:84, February. Type by tautonomy, *Delphinus orca* Linnaeus. Not *Orca* Wagler, 1830.
1860. *Orcinus* Fitzinger, Wiss.-pop. Naturgesch. Saügethiere, 6:204. Type, *Delphinus orca* Linnaeus.

Total length to 30 feet (♂), largest of delphinids. Black dorsally, patches of white posterior to eye and ventral to dorsal fin; ventral surface white forming trident region posterolaterally. Dorsal fin high, prominent, straight on posterior border; pectoral appendages large, ovate, rounded at distal ends. Rostrum of skull broad, elongate; premaxillae narrowed and flattened; pterygoid bones not in contact; roots of teeth flattened, crowns recurved, 10–13 in each tooth-row; approximately 52 vertebrae, anterior most 2 or 3 cervicals fused, 7 anterior ribs double-headed.

KEY TO NORTH AMERICAN SPECIES OF GRAMPUS

1. Known from the Atlantic. . . . *G. orca*, p. 825
1′. Known from the Pacific. . *G. rectipinna*, p. 825

Grampus orca (Linnaeus)
Atlantic Killer Whale

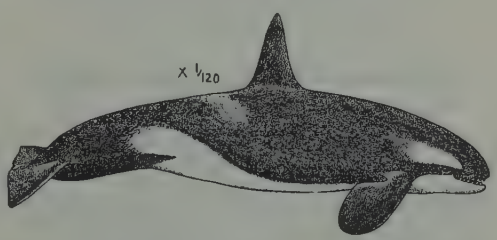
1758. [*Delphinus*] *orca* Linnaeus, Syst. nat., ed. 10, 1:77. Type locality, European seas.
1933. *Grampus orca*, Iredale and Troughton, Rec. Australian Mus., 19(1):35, August 2.
1789. *Delphinus gladiator* Bonnaterre, Tabl. . . . des trois règnes de la nature, cétologie, p. 23. Type locality, Spitzbergen or Davis Strait or New England Coast.
1804. *Delphinus duhamelii* Lacépède, Histoire naturelle des cétacées . . . , p. xliii, 3, 4. Type locality, mouth of Loire, France.
1846. *Orca capensis* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):39, pl. 9. Type locality, Cape of Good Hope, Union of South Africa.
1858. *Delphinus victorini* Grill, Kongl. Svenska Vet.-Akad. Handl. Stockholm, 2(10):21, pl. 1. Type locality, Knysua River, west of Cape Town, Union of South Africa.
1866. *Orcinus eschrichtii* Steenstrup, *in* note by J. Reinhardt, Rec. Memoirs on Cetacea, Ray Soc., p. 188. Type locality, Kollefjord of Strömö, Faeroe Islands, Great Britain.
1866. *Orcinus schlegelii* Lilljeborg, Rec. Memoirs on Cetacea, Ray Soc., p. 235. Type locality, west coast of Norway.
1866. *Orca magellanica* Burmeister, Ann. Mag. Nat. Hist., ser. 3, 18:101, pl. 9, fig. 5, August. Type locality, South of Cape Corrientes, Argentina, mouth of Río del Cristiano, lat. 38° 50′ S.
1870. *Orca stenorhyncha* Gray, Proc. Zool. Soc. London, p. 71, figs. 1 and 3, June. Type locality, North Sea, Weymouth, England.
1870. *Orca latirostris* Gray, Proc. Zool. Soc. London, p. 76, June. Type locality, North Sea.
1871. *Orca africana* Gray, Supplement . . . catalogue of seals and whales in the British Museum, p. 90. Type locality, Algoa Bay, Union of South Africa.
1876. *Orca antarctica* P. Fischer, Jour. de Zool., 5:146. Type locality, Powell and South Shetland Islands, Antarctic Ocean.
1877. *Orca australis* van Beneden and Gervais, Ostéographie des cétacés, p. 540, pl. 47, figs. 1, 2. Type locality, Tasmania or Algoa Bay, Cape of Good Hope, Union of South Africa.
1877. *Orca tasmanica* van Beneden and Gervais, Ostéographie des cétacés, p. 543. Type locality, Tasmania.
1877. *Orca gladiator arcticus* van Beneden and Gervais, Ostéographie des cétacés, Atlas, pl. 47, figs. 3, 5. Type locality, Faeroe Islands, Great Britain.
1877. *Orca gladiator europaeus* van Beneden and Gervais, Ostéographie des cétacés, Atlas, pl. 47, figs. 3, 5. Type locality, Atlantic Ocean.

See characters of the genus. We know of no morphological features that distinguish this species from *G. rectipinna*, although the dorsal fin is said to be higher in *orca* than in *rectipinna*.

It is thought that mating occurs in December and that the gestation period is approximately one year. Young measure approximately 7 ft. at birth. Food consists of whales, seals, sea lions, young walruses, aquatic birds, and fish. Atlantic killer whales are usually found in small groups of 2 or 3 but sometimes occur in "packs" of 20 to 40 individuals.

RANGE.—Atlantic. Coast of Greenland, thence southward to New Jersey.

Grampus rectipinna (Cope)
Pacific Killer Whale



1869. *Orca rectipinna* Cope, Proc. Acad. Nat. Sci. Philadelphia, 21:22. Type locality, coast of California.
1942. *Grampus rectipinna*, Scheffer, Murrelet, 23:44, August 14.
1869. *Orca ater* Cope, Proc. Acad. Nat. Sci. Philadelphia, 21:22. Type locality, Northwest coast from Oregon to Aleutian Islands.
1874. *Orca ater* var. *fusca* Dall, *in* Scammon, Marine mammals . . . north-western coast of North America . . . , p. 298, pl. 17, fig. 3. Type locality, coast of California or Oregon.
1875. *Orca pacifica* Gray, Proc. Zool. Soc. London, p. 76, June. Type locality, North Pacific.

See characters of the genus. We know of no morphological feature that distinguishes this species

from *G. orca*, although the dorsal fin is said to be not so high as in *orca*.

RANGE.—Pacific. Alaska: St. Matthew and Pribilof islands, thence southward to Baja California.

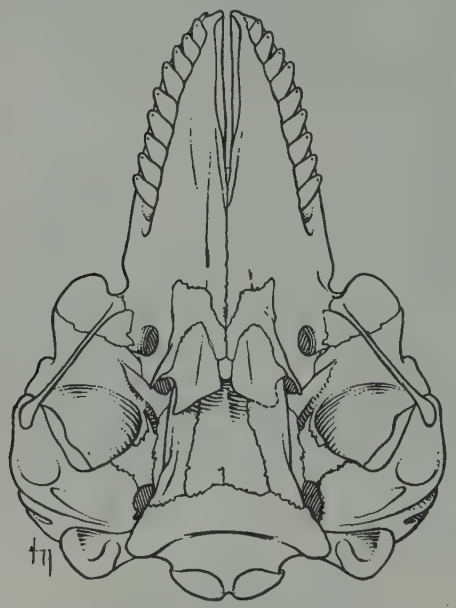


Fig. 453. *Grampus rectipinna*, coast of California, No. 16487 U.S.N.M., sex unknown. Ventral view, X approximately 1/13.

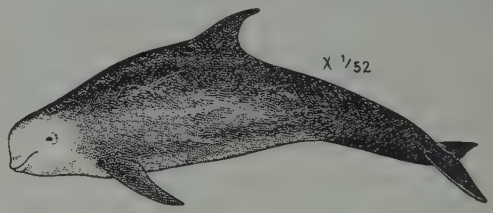
Genus **Grampidelphis** Iredale and Troughton
Grampus

1846. *Grampus* Gray, Ann. Mag. Nat. Hist., ser. 1, 17:85, February. Not *Grampus* Gray, 1828 (but see Schevill, Jour. Mamm., 35:124, February 10, 1954).
1873. *Grayius* Scott, Mammalia, Recent and extinct . . . , p. 104, a renaming of *Grampus* Gray, 1846, but not of Gray, 1828. Not *Grayius* Bonaparte, 1856.
1933. *Grampidelphis* Iredale and Troughton, Rec. Australian Mus., 19(1):31, August 2. Type, *Grampidelphis exilis* Iredale and Troughton.

Total length to 13 ft. Body grayish, paler on ventral surface, pectoral appendages and flukes black. Dorsal fin high, strongly recurved; forehead prominent and bulging. Skull with rostrum expanded anterior to antorbital notches, tapering to obtuse termination anteriorly; area of rostrum anterior to external nares raised, triangular, convex; rostral portion of premaxillae broad and slightly rounded; mandibular symphysis short; pterygoid bones in contact; 2–7 teeth in each mandibular ramus, clustered in region of symphysis; teeth lacking in upper jaws, or if present small and confined to anterior half of rostrum; approximately 68 vertebrae.

The grampus, known also as Risso's dolphin, has been reported as occurring singly or in small schools of up to 12. A single calf 5 ft. to 5½ ft. long is born in December. Food, in so far as known, consists of squids. This genus is monotypic.

Grampidelphis griseus (G. Cuvier)
Grampus or Risso's Dolphin



1812. *Delphinus griseus* G. Cuvier, Ann. Mus. Hist. Nat., Paris, 19:14. Type locality, Brest, France.
1933. *G[rampidelphis]. griseus*, Iredale and Troughton, Rec. Australian Mus., 19(1):32, August 2.

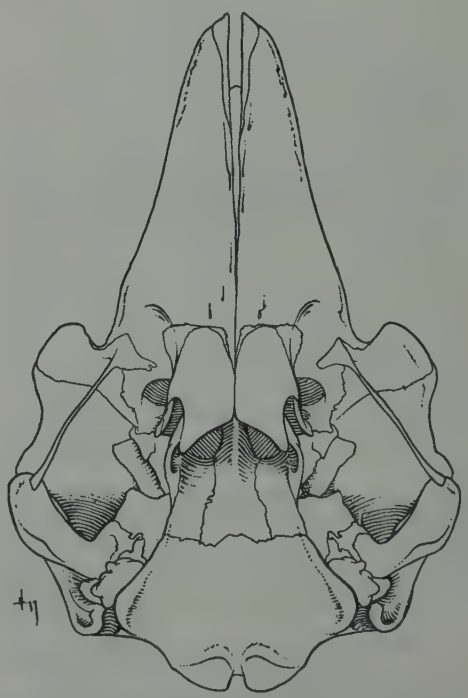


Fig. 454. *Grampidelphis griseus*, outline from photograph of skull No. 27.68 Charleston Museum, sex unknown, from Folly Island, near Charleston, South Carolina. Details from No. 49347 U.S.N.M., sex unknown, from California. Ventral view, X approximately 1/4.4.

1822. *Delphinus rissoanus* Desmarest, Encyclopédie méthodique, mammalogie, Suppl., p. 519. Type locality, Nice, Mediterranean Coast of France.
1838. *Globiocephalus rissii* Anon. Chinese repository, 6:411. Type locality, near Leuchen, South China Seas.
1846. *Grampus cuvieri* Gray, Ann. Mag. Nat. Hist., ser. 1, 17:85. Type locality, Isle of Wight, England.
1846. *Grampus sakamata* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):31. Type locality, Japan.
1850. *Grampus richardsoni* Gray, Catalogue . . . Mammalia in the . . . British Museum, Cetacea, p. 85. Type locality, Kalk's Bay, Simon's Bay, Cape of Good Hope, Union of South Africa.
1859. *Globiocephalus rissoi* Blyth, Jour. Asiatic Soc. Bengal, 28:481. Type locality, unknown.
1866. *Globiocephalus chinensis* Gray, Catalogue of seals and whales in the British Museum, p. 323. Type locality, near Leuchen, South China Seas.
1873. *Grampus stearnsii* Dall, Proc. California Acad. Sci., 5:13, January, type from Monterey, California.
1881. *Grampus sowerbianus* Fischer, Actes Soc. Linn. Bordeaux, 35:210. Type locality, unknown.

See characters of the genus.

RANGE.—Atlantic. Massachusetts: Cape Cod, thence southward to New Jersey: off coast of Atlantic City. Pacific. California: Monterey.

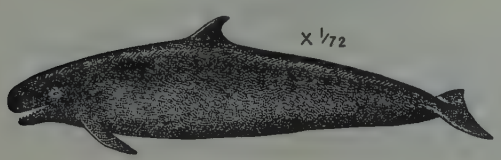
Genus **Pseudorca** Reinhardt—False Killer Whale

1862. *Pseudorca* Reinhardt, Overs. Danske Vidensk. Selsk. Forh., p. 151. Type, *Phocaena crassidens* Owen.

Total length to 18 ft. Blackish throughout. Dorsal fin relatively small, recurved; snout rounded, head flattened. Skull with short, broad rostrum; rostral portion of premaxillae equal to, or greater than, breadth of proximal portion; rostrum truncate distally; pterygoid bones in contact; palatines elongated laterally across optic canal; 8–11 teeth in each tooth-row, circular in cross-section; approximately 50 vertebrae.

False killer whales occur in schools of approximately 100 individuals of both sexes. Breeding probably is sporadic throughout the year, for there is considerable variation in size of fetuses recovered at the same time of year from stranded females. Food seems to consist chiefly of squid, but fish are taken. This genus is monotypic.

Pseudorca crassidens (Owen)
False Killer Whale



1846. *Phocaena crassidens* Owen, A history of British fossil mammals and birds, p. 516. Type locality, Lincolnshire Fens, near Stamford, England (subfossil).
1862. *Pseudorca crassidens*, Reinhardt (on title page of reprint of article from Overs. Danske Vidensk. Selsk. Forh., pp. 103–152).
1865. *Orca meridionalis* Flower, Proc. Zool. Soc. London, for 1864, p. 420, figs. 1, 2, May. Type locality, Tasmania.
1866. *Orca destructor* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 293, October. Type locality, Paita, Peru.
1868. *Globicephalus grayi* Burmeister, Anales Mus. Pub. Buenos Aires, 1:373, pl. 21. Type locality, Coast of Argentina south of the LaPlata River.

See characters of the genus.

RANGE (Bullis and Moore, 1956:4).—Atlantic. North Carolina: Hatteras Village, thence southward to Cuba: Cojímar, and South American waters. Pacific. Washington: Puget Sound, thence southward to Guerrero: Acapulco.

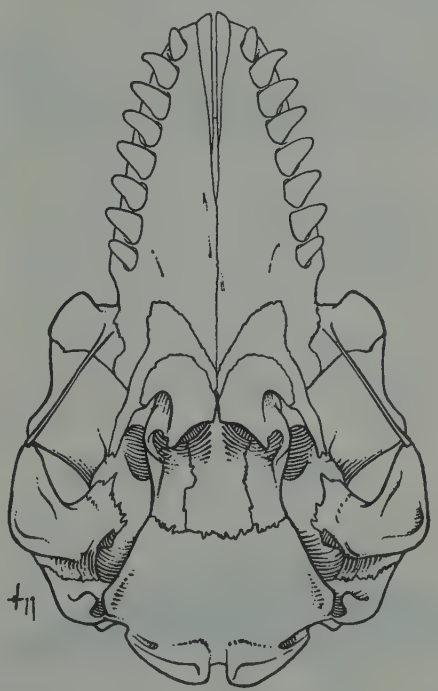


Fig. 455. *Pseudorca crassidens*, near Princeton, Florida, No. 218360 U.S.N.M., sex unknown. Ventral view, X ⅛.

Genus **Globicephala** Lesson—Blackfishes or Pilot Whales

1828. *Globicephala* Lesson, Histoire naturelle . . . des mammifères et des oiseaux découverts depuis 1788, cétacés, p. 441. Type, *Delphinus deductor* Scoresby [= *Delphinus melas* Traill].

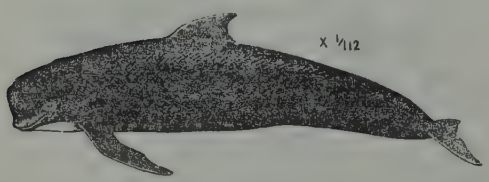
1837. *Globicephalus* Hamilton, *in* The naturalist's library (edit. Jardine), 16:212. Type by tautonomy, *Delphinus globiceps* G. Cuvier.
1864. *Sphaerocephalus* Gray, Proc. Zool. Soc. London, p. 244, November. Type, *Globiocephalus incrassatus* Gray [= *Delphinus melas* Traill].
1884. *Globiceps* Flower, Proc. Zool. Soc. London, for 1883, p. 508, April. Type, *Delphinus melas* Traill.

Total length to 28 ft. Body mostly black, but one species with region of gray immediately posterior to dorsal fin on dorsal surface. Head globular, lip with rounded protuberance; mouth oblique; dorsal fin long, low, thick; pectoral appendages narrow and long. Skull with short, broad rostrum; premaxillae covering anterior half of rostrum, or nearly so; symphysis of mandible short; pterygoid bones in contact; teeth confined to anterior half of rostrum, large, 7–12 in each tooth-row; 57–60 vertebrae.

KEY TO NORTH AMERICAN SPECIES OF GLOBICEPHALA

1. Pectoral appendages long, approximately one-fiifth of total length of body; color black with white markings on throat and belly. *G. melaena*, p. 828
1′. Pectoral appendages short, approximately one-sixth or less of total length of body; color black throughout.
   2. Premaxillae so expanded anteriorly as completely to cover maxillae as viewed from above; known from the Atlantic. *G. macrorhyncha*, p. 828
   2′. Premaxillae not overlaying maxillae to the extent of covering entire border as viewed from above; known from the Pacific. . . . . *G. scammonii*, p. 829

Globicephala melaena (Traill)
Atlantic Blackfish



1809. *Delphinus melas* Traill, Jour. Nat. Philos. Chem. Arts, 22:81, pl. 3, February. Type locality, Scapay Bay, Pomona, Orkney Islands, Scotland.
1898. *Globicephala melaena*, Thomas, The zoologist, ser. 4, 2:99, March.
1812. *Delphinus globiceps* G. Cuvier, Ann. Mus. Hist. Nat., Paris, 19:14, pl. 1, August. Type locality, Sainte Brieux, France.
1820. *Delphinus deductor* Scoresby, Account . . . Arctic regions . . . , 1:496, a renaming of *Delphinus melas* Traill.
1825. *Delphinus grinda* Lyngbye, Tidsskr. Naturvid., 4:232. Type locality, Faeroe Islands, Great Britain.
1827. *Delphinus intermedius* Harlan, Jour. Acad. Nat. Sci. Philadelphia, 6:51, pl. 1, fig. 3, June. Type locality, Salem Harbor, Massachusetts.
1846. *Delphinus harlani* J. B. Fischer, Synopsis mammalium, p. (456) 656. Type locality, coast of New England, a renaming of *Delphinus intermedius* Harlan, owing to the wrong assumption that it was preoccupied by *Delphinus intermedius* Gray, 1827.
1846. *Globiocephalus affinis* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.): 32. Type locality, unknown.
1846. *Globiocephalus svineval* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.): 32. Type locality, east coast of North America.
1849. *Globiocephalus edwardsii* A. Smith, Illustrations of the zoology of South Africa . . . , p. 127. Type locality, near Slangkop, Cape of Good Hope, Union of South Africa.
1862. *Globiocephalus incrassatus* Gray, Proc. Zool. Soc. London, for 1861, p. 309, 2 figs., April. Type locality, coast of Dorsetshire, England.
1871. *Globiocephalus propinquus* Malm, Kongl. Svenska Vet.-Akad. Handl., 9:85. Type locality, North Atlantic, near the equator.
1933. *Globiocephalus ventricosus* Iredale and Troughton, Rec. Australian Mus., 19(1):35, August 2. Not Lacépède, 1804. (See Fraser, Ann. Mag. Nat. Hist., ser. 12, 4:942–944, September, 1951, also Miller and Kellogg, Bull. U.S. Nat. Mus., 205:63, March 3, 1955.)

Total length to 28 ft. Color largely black, sometimes with narrow stripe of white extending from throat to belly. Dorsal fin recurved, situated anterior to mid-point of body; pectoral appendages elongate, slender, and pointed, approximately one-fifth length of body. Skull with rostrum longer than its breadth at base; premaxillae large, flat, not projecting over lateral and anterior margin of maxillae as viewed from above; external nares broad, transversely bordered by narrow plates of premaxillae; approximately 10 teeth in each tooth-row; 58–60 vertebrae.

The Atlantic blackfish is found in schools, sometimes of 100 or more individuals. Mating probably takes place in winter in the southern portion of range. Calves are born the following spring. A female carrying a 3-ft. fetus in April has been reported. Food seemingly consists mostly of squid.

RANGE.—Atlantic Coast of Greenland, thence southward to Virginia: Cape Henry, Princess Anne Co.

Globicephala macrorhyncha Gray
Short-finned Blackfish

1846. *Globicephalus macrorhynchus* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):33. Type locality, South seas.
1950. *Globicephala macrorhyncha*, Fraser, Atlantide Rept. No. 1 (Scientific results of the Danish expedition to the coasts of tropical West Africa 1945–46), p. 59.

1841. *Delphinus globiceps* Schlegel, Abh. Gebiete Zool., p. 33, a *nomen dubium*. Type locality, Japan. Not G. Cuvier, 1812.

1848. *Globiocephalus sieboldii* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.): 32, a renaming of *Delphinus globiceps* Schlegel, 1841.

1852. *Globicephalus indicus* Blythe, Jour. Asiatic Soc. Bengal, 21:358. Type locality, Serampore, Hooghly River, Bengal, India.

1876. *Globicephalus brachypterus* Cope, Proc. Acad. Nat. Sci. Philadelphia, 28:129, type from east coast of Delaware Bay, at mouth of Maurice River. (Regarded as identical with *G. macrorhyncha* by Fraser, Atlantide Rept. No. 1, pp. 50, 52, 58, 59, 1950.)

Total length to 20 ft. Color black throughout. Dorsal fin far anterior, pectoral appendages long, slender, pointed, one-sixth the length of body. Skull large and massive in proportion to body; breadth of rostrum at base exceeding four-fifths rostral length; premaxillae large, flat, greatly expanded anteriorly and projecting over lateral margins of maxillae as viewed from above; external nares transversely narrow, bordered laterally by broad plates of premaxillae; 7–9 teeth in each tooth-row; approximately 57 vertebrae.

This species eats squid, occurs in gams of considerable size, and seems to be migratory.

RANGE.—Atlantic. Coast of New Jersey, thence southward to West Indies and Gulf of Mexico, at least as far west as Texas: Aransas Pass.

Globicephala scammonii Cope
Pacific Blackfish

1869. *Globiocephalus scammonii* Cope, Proc. Acad. Nat. Sci. Philadelphia, 21:21, type from 10 mi. off Pacific coast of Baja California, in lat. 31° N.

Total length to 16 ft. Black throughout except for grayish area just posterior to dorsal fin and narrow white ventral stripe. Skull largest in proportion to body of North American species of *Globicephala*; breadth of rostrum at base approximately four-fifths rostral length; premaxillae flat except anteriorly, so expanded as to cover anterior half of rostral part of maxillae, but not projecting over their lateral margins; external nares broad, bordered by narrow plates of premaxillae; 8–12 teeth in each tooth-row.

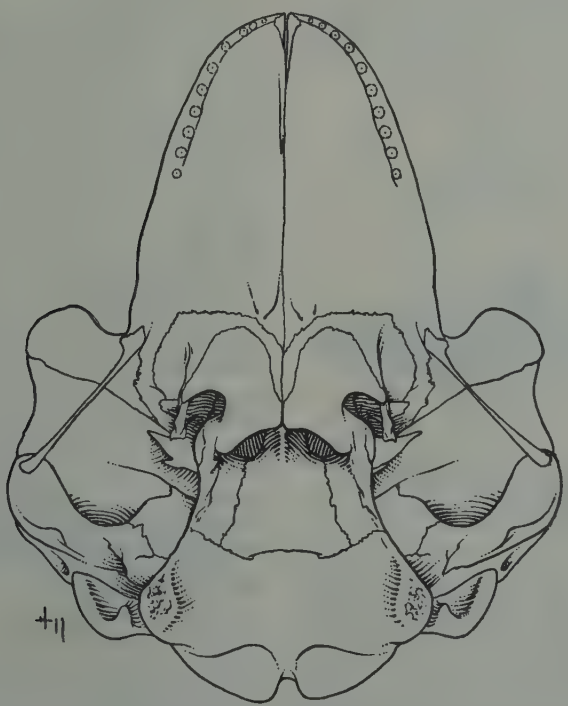


Fig. 456a. *Globicephala scammonii*, holotype, from 10 mi. off Pacific Coast of Baja California, in lat. 31° N, No. 9074 U.S.N.M. Ventral view, X 1/6.3.

The Pacific blackfish occurs in gams of 5 to 50 individuals, usually observed well off shore. An adult female, taken in February, 1853, off the coast of Guatemala, carried a single fetus that measured 3 ft. in total length. Young of a size equal to the fetus mentioned above have been observed with adult females in February and seemingly young are born in midwinter.

RANGE.—Pacific. Alaska: Kanatak, western shore of Alaskan Peninsula, thence southward to Guatemala: Gulf of Duce.

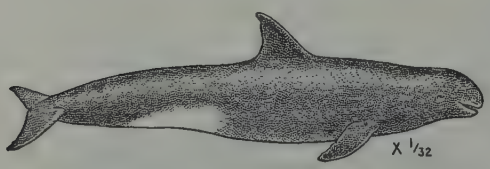
Genus Feresa Gray—Slender Blackfishes

1871. *Feresa* Gray, Supplement . . . catalogue of seals and whales in the British Museum, p. 78. Type, *Delphinus intermedius* Gray [= *Feresa occulta* Jones and Packard].

Total length to approximately 8 ft. Color dark gray except for margins of white about lips, and white area in anal region. Rostrum half of total length of skull; rostral part of premaxillae flat, their inner margins separate throughout; mandible deep between angle and coronoid process, slender at midpoint of rami, obtusely keeled at symphysis; teeth conical, proportionately large, 10–13 in each toothrow; 67 vertebrae.

This genus is known from 3 specimens.

Feresa occulta Jones and Packard
Slender Blackfish



1827. *Delphinus intermedius* Gray, Phil. Mag., 2:396, November. Type locality, unknown. Not Harlan, 1827.
1956. *Feresa occulta* Jones and Packard, Proc. Biol. Soc. Washington, 69:167, December 31.

For a detailed account of this species see Yamada (1954:59–88). Known only from two specimens; the type specimen is a skull only. A second species of the genus, *F. attenuata*, is known by a skull only from the South Pacific.

RANGE.—Known certainly from Taiji, Honshu, Japan (Yamada, 1954:60); may occur in Pacific waters of North America.

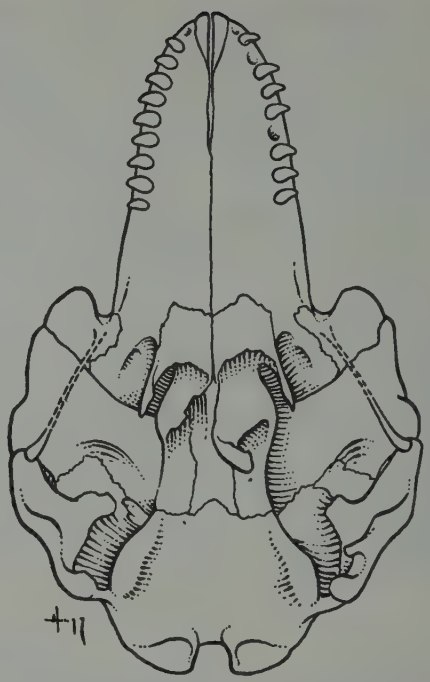


Fig. 456b. *Feresa occulta*, "near" Taiji, Wakayama-Ken, Japan, after Yamada (Sci. Repts. Whales Institute, 9:64, fig. 5a, 1954), ad. ♀. Some details added from a cast of the holotype. Ventral view, X ¼.

Genus Phocoena G. Cuvier—Harbor Porpoises

1816. *Phocoena* G. Cuvier, Le règne animal . . . , 1:279, December. Type, *Delphinus phocoena* Linnaeus. (*Phocoena* G. Cuvier, 1816, considered unavailable by Sherborn, Index animalium, sec. 2 (1801–1805), pt. 1, p. xli, 1922; if so, *Phocoena* G. Cuvier, 1817, *in* Nouv. Dict. Hist. Nat., 9:163, is available.)

Total length to 6 ft. Color slate gray to black above, flanks grayish, fading to white on ventral surface. Dorsal fin triangular. Skull small; rostrum short and broad; pterygoid bones small and not in contact; proximal ends of premaxillae with raised irregular bosses in front of external nares; symphysis of mandible short; 16–27 teeth in each tooth-row, small, compressed, spadelike; 64–65 vertebrae.

KEY TO NORTH AMERICAN SPECIES OF PHOCOENA

1. Vomerine bone separating posteroventral part of palatines; known from the Pacific. *P. vomerina*, p. 831
1′. Vomerine bone not reaching ventral surface of palate, thus not separating palatines on posteroventral margin; known from the Atlantic. . . . . *P. phocoena*, p. 831

Phocoena phocoena (Linnaeus)
Atlantic Harbor Porpoise

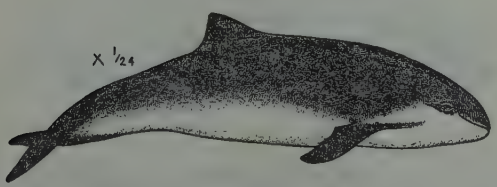
1758. [*Delphinus*] *phocoena* Linnaeus, Syst. nat., ed. 10, 1:77. Type locality, Swedish seas (see Thomas, Proc. Zool. Soc. London, p. 158, March 22, 1911).
1947. *Phocoena phocoena*, Anderson, Bull. Nat. Mus. Canada, 102 (1946):85, January 24.
1804. *Delphinus ventricosus* Lacépède, Histoire naturelle des cétacées . . . , p. xliii, 311. Type locality, River Thames, England.
1827. *Phocaena communis* Lesson, Manuel de mammalogie . . . , p. 413. Type locality, Atlantic Ocean, and French estuaries of la Loire, la Charente, la Seine.
1829. *Phocaena hometi* A. Smith, Zool. Jour., 4:440, May. Type locality, South Africa, Table Bay and seas about Cape of Good Hope.
1865. *Phocaena brachcium* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 279. Type locality, Salem Harbor, Massachusetts.
1876. *Phocaena lineata* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 135. Type locality, Eastport, Maine.
1935. *Phocaena phocaena acuminata* van Deinse, Lev. Nat., 40:115. Type locality, Dishoeck Zoutelande, Walcheren, Holland.
1946. *Phocaena phocaena acuminata* var. *conidens* van Deinse, Zool. Med. Leiden, 26:159. Type locality, Zoutelande, Walcheren, Holland.

Total length to 6 ft. For color see description of the genus. Jaws approximately equal in length, mouth longer than one-half length of pectoral appendages. Vomerine bone not reaching surface of palate and thus not separating palatine bones on posteroventral margin; 23–27 teeth in each tooth-row.

The Atlantic harbor porpoise is usually found along coasts in gams of 50 to 100 individuals. They mate in summer and a single calf is born after a gestation period of approximately a year. At birth the calf is 30 to 34 in. long. Food consists of herring, mackerel, pilchard, whiting, rock cod, small salmon, eels, squid, and occasionally crustaceans.

RANGE.—Atlantic. Greenland: Davis Strait, thence southward to New Jersey–Delaware border: Delaware River.

Phocoena vomerina Gill
Pacific Harbor Porpoise



1865. *Phocaena vomerina* Gill, Proc. Acad. Nat. Sci. Philadelphia, 17:178, type from Puget Sound, Washington.
1942. *Phocoena vomerina*, Scheffer, Murrelet, 23:45, August 14.

Total length to 6 feet. For color see description of the genus. Lower jaw projecting slightly anterior to upper jaw; length of mouth slightly less than one-half length of pectoral appendages. Vomerine bone separating posteroventral part of palatine bones; 23–27 teeth in each tooth-row, usually more visible teeth than in *P. phocoena*.

This species frequents brackish water along coasts; 2 to 7 are frequently seen together. Habits, in so far as known, similar to those of *P. phocoena*.

RANGE.—Pacific. Alaska: Point Barrow (Bee and Hall, 1956:163), thence southwest through Bering Strait and south as far as Jalisco: Banderas Bay.

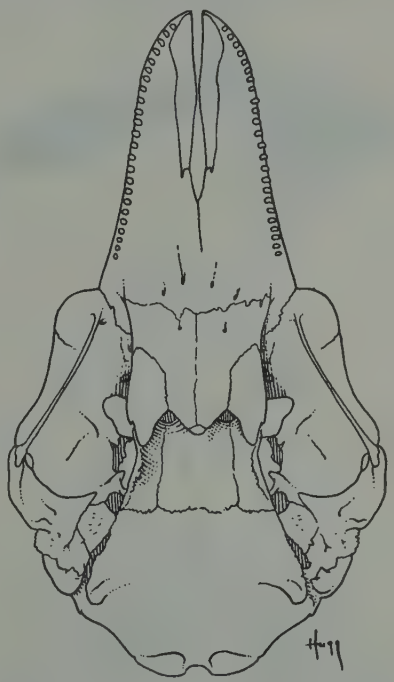


Fig. 457. *Phocoena vomerina*, Bolinas Bay, Marin Co., California, No. 47936 K.U., ♀. Ventral view, X ⅛.

Genus **Phocoenoides** Andrews—Pacific Porpoises

1911. *Phocoenoides* Andrews, Bull. Amer. Mus. Nat. Hist., 30:31, May 16. Type, *Phocoenoides truei* Andrews [= *Phocaena dalli* True].

Total length to 7 ft. Color blackish throughout except area of white on sides posterior to pectoral appendages and region surrounding vent; dorsal fin tipped with white. Posterior margin and dorsal fin slightly concave, anterior margin having faintly marked tubercules. Skull having relatively short, flat beak; temporal fossae small; maxillae short

proximally; external nares large; pterygoids separate; lower jaw projecting slightly anterior to upper jaw; 23–27 teeth in each tooth-row; 97–98 vertebrae; all cervicals united; last 4 caudals united.

Phocoenoides frequents open channels in summer and usually occurs in groups of 2–12 individuals. Young have been observed in August. The female gives birth to a single calf; the gestation period is unknown. Food consists primarily of squids although herrings and saddled blenny are eaten.

Phocoenoides dalli (True)
Dall's Porpoise

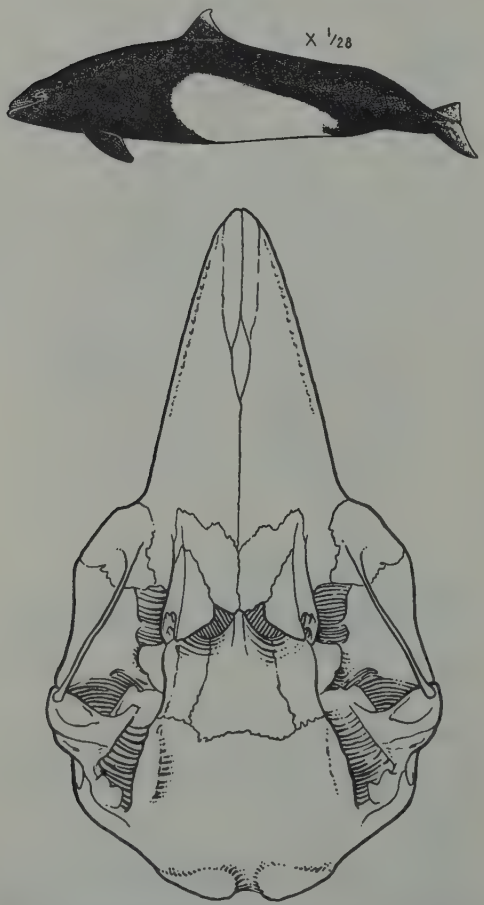


Fig. 458. *Phocoenoides dalli*, [holotype of *P. truei* Andrews], Aikawahama, Japan, No. 31425 A.M.N.H., ♂, after Andrews (Bull. Amer. Mus. Nat. Hist., 30(Art. 4): fig. 5, 1911). Ventral view, X ⅛.

1885. *Phocaena dalli* True, Proc. U. S. Nat. Mus., 8:95, June 19, type from strait west of Adakh [= Adak], Aleutian Islands, Alaska.

1911. *P[hocoenoides]. dalli*, Andrews, Bull. Amer. Mus. Nat. Hist., 30:34, May 16.

1911. *Phocoenoides truei* Andrews, Bull. Amer. Mus. Nat. Hist., 30:32, May 16, type from Aikawahama, Rikuzen Province, Japan. (Regarded as inseparable from *P. dalli* by Benson, Jour. Mamm., 27:373, November 25, 1946.)

See characters of the genus.

RANGE.—Pacific. Alaska: Western Aleutian Islands, thence southward to California: Long Beach (Butterworth, 1957:126).

SUBORDER MYSTICETI

North American species revised by True, Smiths. Contrib. Knowl., 33:1–332, 97 figs., 50 pls., August 29, 1904.

Whale bone present; teeth absent after birth; paired narial openings; maxillae ending in front of orbital processes of frontal bones; maxillae having orbital plates; nasal bones forming anterior part of roof of nasal passages; passage of nares directed upwards and forwards.

KEY TO FAMILIES OF MYSTICETI

1. External grooves on throat absent; cervical vertebrae fused; rostral and cranial elements of skull interdigitate only slightly or not at all; nasals and nasal branches of premaxillae situated entirely anterior to level of orbital wings of frontals. . . . . Balaenidae, p. 839

1′. External grooves on throat present; cervical vertebrae separate; rostral and cranial elements of skull interdigitate; nasals and nasal branches of premaxillae not situated entirely anterior to level of orbital wings of frontals.

2. Dorsal fin absent; external throat grooves 2–4; parietal bones entirely behind nasals and nasal branches of maxillae and premaxillae [occipital shield not extending forward over or beyond articular portion of squamosal]; frontal bones clearly exposed on vertex. Eschrichtidae, p. 832

2′. Dorsal fin present; external throat grooves numerous; parietal bones extending forward laterally beyond level attained by nasals and nasal branches of maxillae and premaxillae [occipital shield extending forward over orbit and beyond articular portion of squamosal]; frontal bones barely or not at all exposed on vertex. Balaenopteridae, p. 834

FAMILY ESCHRICHTIDAE—Gray Whale

Total length to 50 ft. Mottled gray throughout. Dorsal fin absent, small humps on posterior middorsal region; 2–4 short throat grooves; baleen yel-

lowish, less than 20 in. long; snout high and rigid; mouth bisects head. Skull having deep rather than broad rostrum; supraorbital processes of frontal bones broad at base, nasal bones greatly enlarged; occipital shield separating parietal bones at vertex of skull, not extending forward over level of orbit or beyond anterior level attained by articular part of squamosal; parietal bone transversely united by narrow band of interparietal; surface of occipital shield tuberculate; premaxillae forming rim to external nares; mandible only slightly bowed laterally; cervical vertebrae separate.

Gray whales are migratory, moving from Arctic waters southward along the California Coast in December and January to their breeding lagoons along the coasts of western Baja California, Sonora, and Sinaloa. Females give birth to a single calf, 14–17 ft. in length. Calves are weaned after 6–8 months. Females are said to breed soon after birth of young. Gray whales feed on sardines in southern waters and on "krills" or amphipod crustaceans in northern waters. Formerly abundant off the California Coast, this species was nearly extirpated by whalers. The number of gray whales is increasing owing to protection. This family contains a single genus.

Genus **Eschrichtius** Gray—Gray Whale

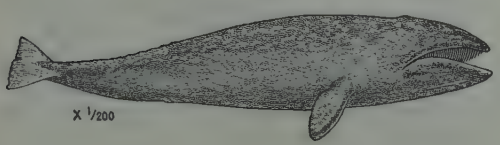
1864. *Eschrichtius* Gray, Ann. Mag. Nat. Hist., ser. 3, 14: 350, November. Type, *Balaenoptera robusta* Lilljeborg [= *Balaena gibbosa* Erxleben].

1868. *Agaphelus* Cope, Proc. Acad. Nat. Sci. Philadelphia, 20:159, 233. Type, *Agaphelus glaucus* Cope [= *Balaena gibbosa* Erxleben].

1869. *Rhachianectes* Cope, Proc. Acad. Nat. Sci. Philadelphia, 21:15. Type, *Agaphelus glaucus* Cope [= *Balaena gibbosa* Erxleben].

See characters of the family. The genus, as here considered, is monotypic.

Eschrichtius gibbosus (Erxleben) Gray Whale



1777. [*Balaena*] *gibbosa* Erxleben, Systema regni animalis . . . , p. 610. Type locality, coast of New England. (Based on "scrag whale" of Dudley, Phil. Trans. Roy. Soc. London, 33:258, 1725.)

1937. *Eschrichtius gibbosus*, van Deinse and Junge, Temminckia, 2:181.

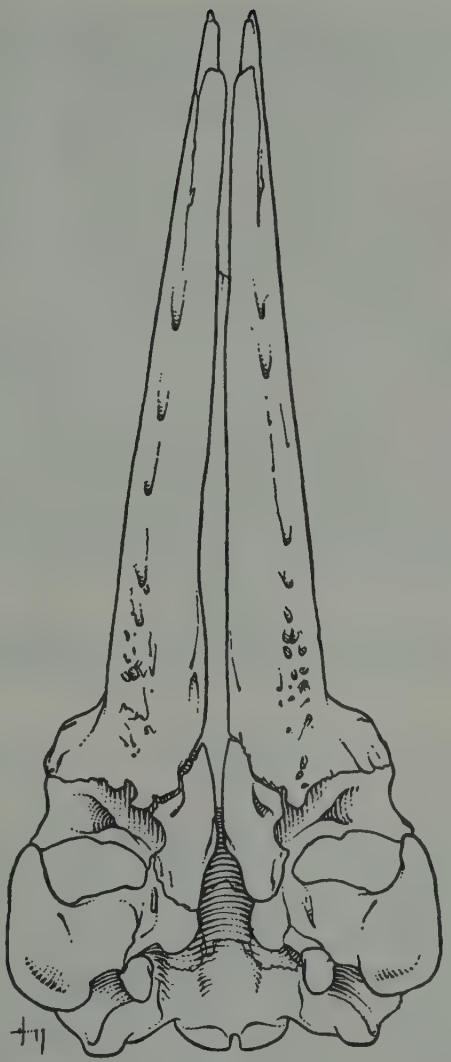


Fig. 459. *Eschrichtius gibbosus*, Monterey, California, No. 13303 U.S.N.M., sex unknown. Ventral view, X 1/15.

1861. *Balaenoptera robusta* Lilljeborg, Forh. Skand. Natur/. Ottende Møde, Kjöbenhavn, for 1860, 8:602. Type locality, Sweden.

1868. *Agaphelus glaucus* Cope, Proc. Acad. Nat. Sci. Philadelphia, 20:160, type from Monterey Bay, California.

After comparing subfossil material of *Eschrichtius robustus* (Lilljeborg) from the Atlantic with Recent material of *Rhachianectes glaucus* (Cope) from the Pacific, van Deinse and Junge (*supra*) concluded:

(1) That the 2 whales were congeneric and that the first available generic name was *Eschrichtius*, and (2) that the 2 whales were conspecific and that the earliest available name was *gibbosus*. Schevill (1952:3) and Miller and Kellogg (1955:666) opine: (1) That the Atlantic whale and the Pacific whale may not be conspecific, and (2) that *Balaena gibbosa* Erxleben may not have been based on a species of the genus *Eschrichtius*. Therefore, Schevill (and also Miller and Kellogg) uses the name *Eschrichtius glaucus* (Cope) for the Recent species of the Pacific. We are certain that the knowledge about whales possessed by Miller and especially by Kellogg far surpasses our own and suppose that Schevill's does too. Therefore we guess that the name chosen by them will be found to be correct. But, there is no indication that Schevill or Miller and Kellogg examined any pertinent specimens in arriving at their conclusion. On the contrary, van Deinse and Junge did examine specimens as a basis for arriving at their opinion; consequently, we follow them in using the name *Eschrichtius gibbosus* (Erxleben).

See characters for the family.

RANGE.—Pacific. Bering Strait, thence southward to latitude of Jalisco. Range formerly included North Atlantic.

FAMILY BALAENOPTERIDAE—Fin-backed Whales

Total length to 105 ft. Dorsal fin present; throat grooves numerous; sheets of whalebone numerous, only moderately long (shorter and broader than in Balaenidae). Skull having rostrum flat and broad; lateral bowing at lower jaws increases buccal capacity; parietal bones extending anterolaterally beyond posterior margin of nasal bones; frontal bones not exposed on vertex of skull; occipital shield extending anteriorly over level of orbit and beyond anterior level attained by articular part of squamosal; ventral surface of squamosal bones deeply concave; ribs articulating with transverse processes of vertebrae; cervical vertebrae separate.

KEY TO NORTH AMERICAN GENERA OF BALAENOPTERIDAE

1. Pectoral appendages long, approximately one-third total length of animal, serrate on anterior border; acromion and coracoid processes of scapula rudimentary. . *Megaptera*, p. 837
1′. Pectoral appendages short, one-sixth to one-seventh of total length of animal, smooth on anterior border; acromion and coracoid processes of scapula well developed.
2. Rostrum triangular as viewed from above; occipital bone separate from nasal bones. *Balaenoptera*, p. 834
2′. Rostrum parallel-sided posteriorly and curved inward at tip as viewed from above; occipital bone touching posterior margin at nasal bones. . . *Sibbaldus*, p. 836

Genus **Balaenoptera** Lacépède—Fin-backed Whales

1804. *Balaenoptera* Lacépède, Histoire naturelle des cétacées . . . , p. xxxvi. Type, by subsequent selection (Flower, Proc. Zool. Soc. London, for 1864, p. 395, May, 1865), *Balaena rostrata* Fabricius [= *Balaenoptera acutorostrata* Lacépède].
1829. *Rorqual* G. Cuvier, Le règne animal . . . , 1:298. Type not designated, but genus included at least *Balaena boops* Linnaeus [= *Balaena physalus* Linnaeus] and *Balaena musculus* Linnaeus.
1836. *Rorqualus* F. Cuvier, Histoire naturelle des cétacés . . . , p. 303, p. 20, an emendation of *Rorqual* G. Cuvier.
1849. *Pterobalaena* Eschricht, Kongl. Dansk. Vidensk. Selsk. Skr., 1:108. Type, *Balaena physalus* Linnaeus.
1864. *Benedenia* Gray, Proc. Zool. Soc. London, p. 211, November. Type, *Benedenia knoxii* Gray [= *Balaena physalus* Linnaeus].
1866. *Rudolphius* Gray, Catalogue of seals and whales in the British Museum, p. 170. Type, *Balaenoptera laticeps* Gray [= *Balaenoptera borealis* Lesson].
1866. *Swinhoia* Gray, Catalogue of seals and whales in the British Museum, p. 382. Type, *Balaenoptera swinhoii* Gray [= *Balaena physalus* Linnaeus].

Total length to 80 ft. Pectoral appendages short, smooth on anterior border; black or grayish-black dorsally, flanks having at least some white. Skull with triangular rostrum as viewed from above; narrow but evident portion of frontal bones exposed on vertex of skull; occipital shield not touching nasal bones; acromion and coracoid processes of scapula well developed.

KEY TO NORTH AMERICAN SPECIES OF BALAENOPTERA

1. Length of baleen, exclusive of bristles, approximately 10 in.; middorsal surface of pectoral appendage with white band. *B. acutorostrata*, p. 836
1′. Length of baleen, exclusive of bristles, 28–36 in.; dorsal surface of pectoral appendage dark gray, bluish or brown.
2. Major baleen plates 350–400; color of plates purple and white; ventral surface of tail flukes white. . . *B. physalus*, p. 835
2′. Major baleen plates 320–340; color of plates blackish with curly white "hairs"; ventral surface of tail flukes usually dark blue to brown. . . . . *B. borealis*, p. 835

Balaenoptera physalus (Linnaeus)
Fin-backed Whale

1758. [*Balaena*] *physalus* Linnaeus, Syst. nat., ed. 10, 1:75. Type locality, Spitzbergen seas (see Thomas, Proc. Zool. Soc. London, p. 156, March 22, 1911).
1862. *Balaenoptera physalis*, Schlegel, De Dieren van Nederland . . . , Zoogdieren, p. 101.
1758. [*Balaena*] *boops* Linnaeus, Syst. nat., ed. 10, 1:76. Type locality, "In Oceano septentrionali."
1804. *Balaenoptera gibbar* Lacépède, Histoire naturelle des cétacées . . . , pp. xxxvi and 114. Type locality, Arctic Ocean near Greenland.
1804. *Balaenoptera rorqual* Lacépède, Histoire naturelle des cétacées . . . , p. xxxvi and 126. Type locality, Eastern North Atlantic, Scotland to Mediterranean.
1811. *Balaena sulcata* Neill, Mem. Wernerian Nat. Hist. Soc., 1:212. Type locality, near Alloa, Scotland.
1828. *Balaenoptera mediterraneensis* Lesson, Histoire naturelle . . . des mammifères et des oiseaux découverts depuis 1788, cétacés, p. 442, a renaming of *Balaenoptera rorqual* Lacépède. Type locality, Mediterranean.
1828. *Physalis vulgaris* Flemming, A history of British animals . . . , p. 32. Type locality, unknown.
1829. *Balaena antiquorum* J. B. Fischer, Synopsis mammalium, p. 525. Type locality, Mediterranean Sea.
1829. *Balaenoptera aragous* Farines and Carcassonne, Mém. sur un Cétacé échoué 27 Nov. 1928 [*sic*] sur la Côte de Saint-Cyprien, p. 6. Type locality, Coast of St. Cyprien, Corsica.
1840. *Balaenoptera tenuirostris* Sweeting, Charlsworth's Mag. Nat. Hist., 4:343, July. Type locality, Charmouth Beach, England.
1841. *Balaena sulcata arctica* Schlegel, Abh. Gebeite Zool., 1:38, 6 pls., 5 figs. Type locality, coast of Holland.
1856. *Physalus duguidii* Heddle, Proc. Zool. Soc. London, p. 187, pls. 44–45, December 11. Type locality, Island of Laman, Orkney Islands, Scotland.
1861. *Balaena robusta* Lilljeborg, Forh. Skand. Naturf. Ottende Møde, Kjöbenhavn, for 1860, 8:602. Type locality, Sweden.
1864. *Benedenia knoxii* Gray, Proc. Zool. Soc. London, p. 212, 2 figs., November. Type locality, coast of North Wales.
1866. *Balaenoptera swinhoii* Gray, Proc. Zool. Soc. London, for 1865, p. 725, 6 figs., April. Type locality, Takow, Formosa.
1868. *Swinhoia chinensis* Gray, Synopsis of the . . . whales and dolphins in the . . . British Museum, p. 3, a renaming of *Balaenoptera swinhoii* Gray.
1869. *Balaenoptera velifera* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 16, July 20. Type locality, "Oregon coasts."
1869. S[*ibbaldius*]. *tuberosus* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 16, July 20. Type locality, coast of eastern North America.
1869. *Sibbaldius tectirostris* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 17, July 20. Type locality, Sinepuxent Bay, Maryland.
1879. *Balaenoptera blythii* Anderson, Anatomical and zoological researches . . . expeditions to western Yunnan in 1868 and 1875 . . . , p. 564. Type locality, Indian Coast.
1884. *Dubertus rhodinsulensis* Trumbull, *in* G. B. Goode, Fisheries and fishery industries of the United States, sec. 1, 1:29, a *nomen nudum*. Type locality, Rhode Island.
1901. [*Balaenoptera velifera*] *copei* Elliot, Field Columb. Mus., Publ. 45, Zool. Ser., 2:13, March 16, type from Shumagin Islands, Alaska.

Total length to 81 ft. Grayish-black dorsally, white ventrally including tail flukes; left ramus grayish externally, whereas right ramus white externally; baleen purple and white, sometimes lead-colored. Posterior middorsal region distinctly and acutely ridged; dorsal fin small, situated posterior to middle of body; major baleen plates 350–400, their greatest length, exclusive of bristles, approximately 36 in.

This whale usually occurs in groups of 2 to 3 but gams of considerable numbers have been reported where food is plentiful. The breeding season is thought to extend from May to August. A gestation period of 360 days has been recorded. Calves measure 21 to 22 ft. at birth and nurse for approximately 6 months. Food consists of "krill," crustaceans and fishes.

RANGE.—Atlantic. Greenland: Melville Island, thence southward to the Caribbean Sea. Pacific. Alaska: St. Paul Island, Pribilof Islands, thence southward to Baja California.

Balaenoptera borealis Lesson
Sei Whale

1828. *Balaenoptera borealis* Lesson, Histoire naturelle . . . des mammifères et des oiseaux découverts depuis 1788, cétacés, p. 342. Type locality, Gromitz, Lubeck Bay, Schleswig-Holstein, Germany.
1822. *Balaena rostrata* Rudolphi, Abh. k. Akad. Wiss., Berlin, for 1820–21, pp. 27–40, 5 pl. Type locality, North Sea. Not Müller, 1776, nor O. Fabricius, 1780.
1844. *Balaenoptera arctica* Temminck and Schlegel, *in* Siebold, Fauna Japonica, mamms. marins, p. 26. Type locality, Japan. Not Schlegel, 1841.
1846. *Balaenoptera laticeps* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.): 20. Type locality, North Sea, coast of Holstein.
1850. *Physalus? Iwasi* Gray, Catalogue . . . Mammalia in the . . . British Museum, Cetacea, p. 42, a renaming of *Balaenoptera arctica* Temminck and Schlegel.
1865. *Sibbaldius schlegelii* Flower, Proc. Zool. Soc. London, for 1864, p. 408, May. Type locality, Java.

Total length to 60 ft. Gray to bluish-gray dorsally, laterally and on posterior half of venter; anterior half of venter white; baleen blackish with curly white "hairs" on proximal surface. External throat grooves not reaching chin; dorsal fin high and falcate, approximately two-thirds the way back along middorsal line; major baleen plates 320–340; greatest length of baleen, exclusive of bristles, approximately 29 in.

These whales are migratory, moving northward to temperate and subarctic waters in the warmer seasons and southward to subtropical waters in the winter. Breeding and calving take place in winter. Calves are reported to be 15–16 ft. long at birth and to nurse approximately 5 months. Food consists of plankton. Sei whales are of little economic importance as they yield little oil.

RANGE.—Atlantic. Coast of Labrador, thence southward to Campeche: Golfo de Campeche. Pacific. Bering Sea, thence southward to Baja California.

Balaenoptera acutorostrata Lacépède
Little Piked Whale

1804. *Balaenoptera acuto-rostrata* Lacépède, Histoire naturelle des cétacées . . . , p. xxxvii. Type locality, European seas.
1780. *Balaena rostrata* O. Fabricius, Fauna Groenlandica . . . , p. 40. Type locality, Greenland seas. Not Müller, 1776.
1845. *Balaenoptera eschrichtii* Rasch, Nytt. Mag. Naturv., 4:123. Type locality, Swedish coasts.
1849. *Pterobalaena minor bergensis* Eschricht, Kongl. Dansk. Vidensk. Selsk. Skr., 1:109. Type locality, Norway.

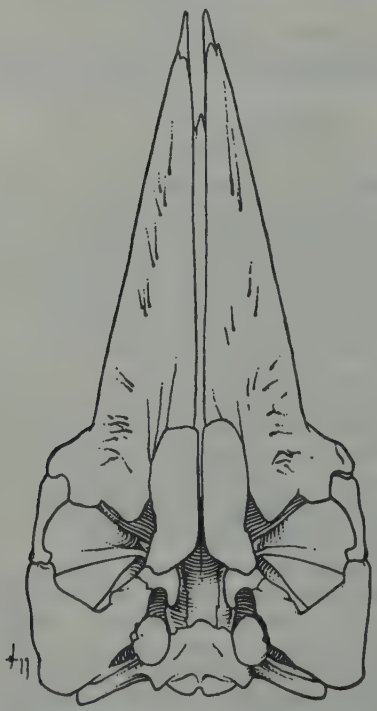


Fig. 460. *Balaenoptera acutorostrata*, Monomoy Pt. Lighthouse, Harwich Port, Massachusetts, No. 20931 U.S.N.M., sex unknown. Ventral view, X 1/10.

1872. *Balaenoptera davidsoni* Scammon, Proc. California Acad. Sci., 4:269, October 4, type from Admiralty Inlet, Puget Sound, Washington.
1877. *Sibbaldius mondinii* Capellini, Mem. Accad. Sci. Inst. Bologna, ser. 3, 7:423. Type locality, Adriatic Sea.
1879. *Balaenoptera edeni* Anderson, Anatomical and zoological researches . . . expeditions to western Yunnan in 1868 and 1875 . . . , p. 551, pl. 44. Type locality, Gulf of Martaban, between Sittang and Beeling rivers, Burma.

Total length to 33 ft. Grayish-black dorsally, white ventrally including ventral aspects of pectoral appendages and flukes; dorsal surface of pectoral appendage with conspicuous white band; baleen yellowish-white to pure white. External throat grooves reaching to chin; dorsal fin prominent, falcate; greatest length of baleen, exclusive of bristles, approximately 10 in.

Little is known of the ecology of little piked whales. They are usually solitary in habit but small groups have been observed in bays and inlets. The gestation period is thought to be approximately 10 months. Calves, 9 ft. long at birth, are born from November to January. Seemingly migratory, this species feeds on plankton and fishes.

RANGE.—Atlantic. Franklin: Baffin Bay, thence southward to Florida: Little Duck Key (Moore and Palmer, 1955: 429). Pacific. Bering Sea, thence southward to Baja California.

Genus Sibbaldus Gray—Blue or Sulphur-bottomed Whale

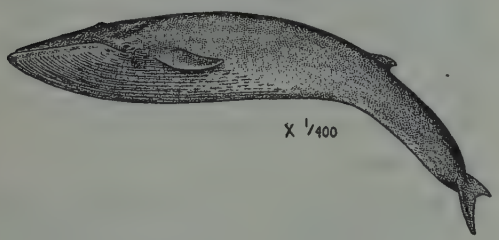
1864. *Sibbaldus* Gray, Proc. Zool. Soc. London, p. 222, November. Type, by tautonomy, *Sibbaldus borealis* Gray [= *Balaena musculus* Linnaeus].
1865. *Sibbaldius* Flower, Proc. Zool. Soc. London, for 1864, p. 391, May, an emendation of *Sibbaldus* Gray.
1866. *Cuvierius* Gray, Catalogue of seals and whales in the British Museum, p. 114. Type, *Physalus latirostris* Flower [= *Balaena musculus* Linnaeus].
1867. *Flowerius* Lilljeborg, Nova Acta Reg. Soc. Sci., Upsala, ser. 3, 6(6):11. Type, "*Flowerius gigas* (Eschricht), *Sibbaldius borealis* Gray" [= *Balaena musculus* Linnaeus].

Total length to 100 ft. Bluish dorsally with patches of gray on back and sides, yellowish to white ventrally; pectoral appendages white below; baleen black. Rostrum parallel-sided posteriorly and curved inward at tip as viewed from above; frontal bones extremely narrow on vertex of skull so that parietal bones in contact with maxillae; occipital shield touching nasal bones; acromion and coracoid processes of scapula well developed; pectoral appendages short, smooth on anterior border.

Blue whales, the largest known animals, occur in summer near polar pack ice in both hemispheres. They seemingly avoid tropical waters but wander a

great deal in search of food, which consists of crustaceans or "krill." The breeding season in the southern hemisphere is in June and July (winter). A female normally gives birth to a single calf, 23–26 ft. in length, but twins have been reported. The calf is nursed for approximately seven months and is weaned at an average length of approximately 52 ft. This genus is monotypic.

Sibbaldus musculus (Linnaeus)
Blue or Sulphur-bottomed Whale



1758. [*Balaena*] *musculus* Linnaeus, Syst. nat., ed. 10, 1:76. Type locality, Firth of Forth, Scotland (see Thomas, Proc. Zool. Soc. London, p. 156, March 22, 1911).
1923. *Sibbaldus musculus*, Miller, Smiths. Miscl. Coll., 76(5):20, August 31.
1804. *Balaenoptera jubartes* Lacépède, Histoire naturelle des cétacées . . . , p. xxxvii and 120. Type locality, Greenland seas to Iceland.
1847. *Physalus* (*Rorqualus*) *sibbaldi* Gray, Proc. Zool. Soc. London, p. 92, July 20. Type locality, coast of Yorkshire, England.
1857. *Balaenoptera gigas* Reinhardt, *in* Rink, Grönland, geografisk og statistisk beskrevet, Kjöbenhavn, 1(2):10. Type locality, Greenland seas.
1859. *Balaenoptera indica* Blyth, Jour. Asiatic Soc. Bengal, 29:488. Type locality, Sondip, Bay of Bengal, India.
1865. *Physalus latirostris* Flower, Proc. Zool. Soc. London, for 1864, p. 414, May. Type locality, coast of Holland.
1865. *Balaenoptera patachonica* Burmeister, Proc. Zool. Soc. London, p. 191, 11 figs., June. Type locality, Banks of La Plata River, "some leagues from Buenos Aires," Argentina.
1866. *Balaenoptera carolinae* Malm, Nagra blad om Hvaldjur i Allmaenhet og Balaenoptera carolinae i Synnerhet, Goeteborg (pagination unknown). Type locality, unknown.
1869. *Sibbaldius sulfureus* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 20, July 20. Type locality, Northwest Coast of United States.
1877. *Pterobalaena gryphus* Munter, Mitth. Naturw. Verein von Neu-Vorpommern u Rügen, 9:1, 2 pls. Type locality, Wieck bei Greifswald, Germany.

See characters of the genus.

RANGE.—Atlantic. Franklin: Baffin Bay, thence southward to Panamá: Canal Zone. Pacific. Alaska: St. Matthew Islands, thence southward to waters off Nicaragua.

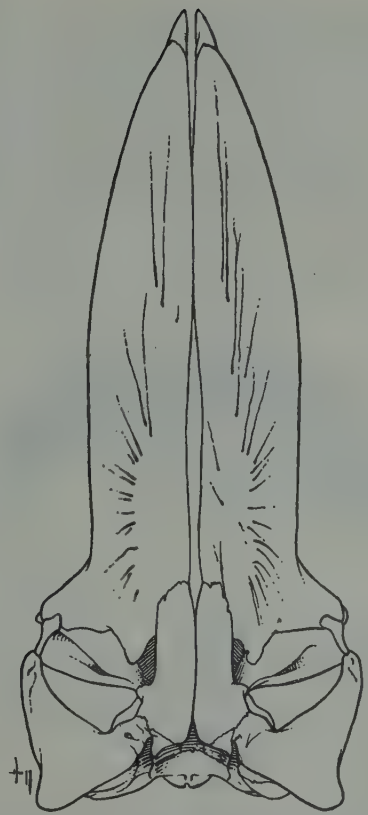


Fig. 461. *Sibbaldus musculus*, vicinity of Balaena Station, Hermitage Bay, Newfoundland, No. 49757 U.S.N.M., ♂. Ventral view, X 1/46.

Genus Megaptera Gray—Hump-backed Whale

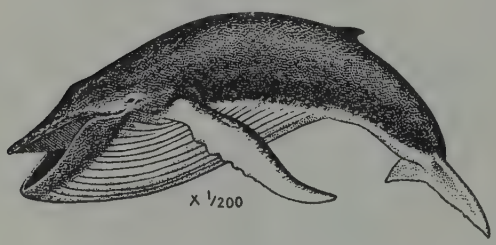
1846. *Megaptera* Gray, Ann. Mag. Nat. Hist., ser. 1, 17:83, February. Type, *Megaptera longipinna* Gray [= *Balaena novae angliae* Borowski].
1849. *Kyphobalaena* Eschricht, Kongl. Dansk. Vidensk. Selsk. Skr., 1:108. Type, *Balaena boops* O. Fabricius [= *Balaena novae angliae* Borowski].
1864. *Poescopia* Gray, Proc. Zool. Soc. London, p. 207, fig. 3, November. Type, *Balaena lalandii* Fischer [= *Balaena novae angliae* Borowski].

Total length to 50 ft. Dorsum and sides black; venter white, most posterior part mottled black and white; pectoral appendages black above, white below; approximately 300, nearly black baleen plates. Knoblike protuberances on anterodorsal part of snout and on lower jaw; each pectoral appendage serrate on anterior border and approximately a third of total length of animal; dorsal fin small, falcate, situated two-thirds length of body

posterior to snout; acromion and coracoid processes of scapula rudimentary.

Hump-backed whales migrate, and spend the winter in tropical and subtropical waters, returning to polar seas in spring. Birth of young, followed by mating, occurs in winter. Females give birth to a single calf, 15–16 ft. in length, which is nursed for approximately one year. Food is mainly shrimplike crustaceans but fish and birds are eaten.

Megaptera novaeangliae (Borowski)
Hump-backed Whale



1781. *Balaena novae angliae* Borowski, Gemeinnüzzige Naturgeschichte des Thierreichs . . . , 2(1):21. Type locality, coast of New England.

1932. *Maegaptera novaeangliae*, Kellogg, Proc. Biol. Soc. Washington, 45:148, September 9.

1780. *Balaena boops* O. Fabricius, Fauna Groenlandica . . . , p. 36. Type locality, Greenland seas, especially Pamiut and Pissukbik. Not Linnaeus, 1758.

1789. *B[alaena]. nodosa* Bonnaterre, Tabl. . . . des trois règnes de la nature, cetologie, p. 5. Type locality, New England Coast.

1822. *Balaenoptère poeskop* Desmoulins, *in* Dict. Class. Hist. Nat., 2:164. Type locality, Cape of Good Hope, Union of South Africa.

1828. *Balaenoptera australis* Lesson, Histoire naturelle . . . des mammifères et des oiseaux découverts depuis 1788, cétacés, p. 372. Type locality, Cape of Good Hope, Union of South Africa.

1829. *Balaena lalandii* J. B. Fischer, Synopsis mammalium, p. 525. Type locality, Cape of Good Hope, Union of South Africa.

1832. *Balaena longimana* Rudolphi, Abh. k. Akad. Wiss., Berlin, p. 133, pl. 1–5. Type locality, unknown.

1834. *Balaenoptera capensis* A. Smith, South African Quart. Jour., 2:130. Type locality, Cape of Good Hope, Union of South Africa.

1841. *Balaena sulcata antarctica* Schlegel, Abh. Gebeite Zool., 1:43. Type locality, south coast of Japan.

1842. *Balaenoptera leucopteron* Lesson, Nouveau tableau du règne animal . . . mammifères, p. 202, a *nomen nudum*. Type locality, high southern latitudes.

1846. *Megaptera americana* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):17. Type locality, Bermuda Islands.

1863. *Balaenoptera syncondylus* A. Müller, K. Phys.-oekonom. Ges. Konigsberg, 4:38, pls. 1–3. Type locality, "Ostsee an die kurische Nehrung," Germany.

1865. *Megaptera gigas* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 179, December. Type locality, unknown. Cope (*loc. cit.*) ascribes this name to Rudolphi, Mem. Acad. Berlin, p. 133, 1829 (not seen by us), but G. M. Allen, Bull. Mus. Comp. Zool., 83:267, February, 1939, credits the name *Megaptera gigas* to Cope.

1865. *Megaptera osphyia* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 180, December, type from 40 mi. off Petit Manan Lighthouse, Maine.

1866. *Megaptera longimana* var. *morrei* Gray, Catalogue of seals and whales in the British Museum, p. 122. Type locality, Estuary of the Dee, Scotland.

1866. *Megaptera kurzira* Gray, Catalogue of seals and whales in the British Museum, p. 130, a renaming of *Balaena sulcata antarctica* Schlegel.

1868. *Kyphobalaena képorkak* van Beneden, Bull. Acad. Roy. Sci., Lettres et Beaux-Arts Belgique, Bruxelles, 25: 116. Type locality, unknown.

1871. *Megaptera bellicosa* Cope, Proc. Amer. Phil. Soc., 12:107, 7 figs. Type locality, St. Bartholomew's, West Indies.

1883. *Megaptera indica* Gervais, C. R. Acad. Sci. Paris, 97: 1566. Type locality, Persian Gulf.

See characters of the genus.

RANGE.—Atlantic. Greenland: Disco Bay, thence southward to South American waters. Pacific. Alaska: Pribilof Islands, thence southward to Panamá; Golfo de Panamá.

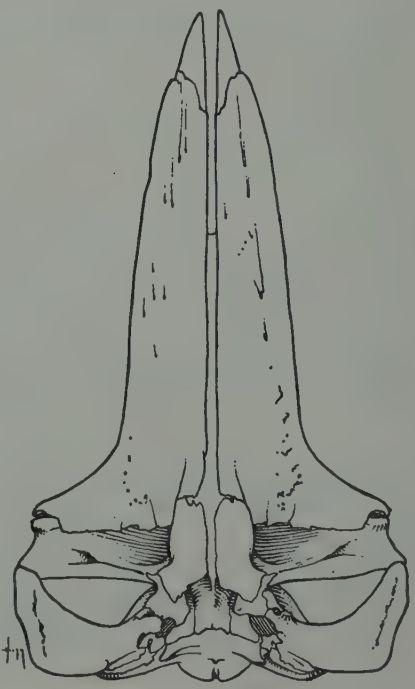


Fig. 462. *Megaptera novaeangliae*, Acad. Nat. Sci. Philadelphia, after Elliot (Field Columb. Mus., Publ. 95, Zool. Ser., 4(1):pl. 11, 1904), sex unknown. Ventral view, X approximately 1/26.

FAMILY BALAENIDAE—Right and Bowhead Whales

Total length to 70 ft. Head large, about ⅓ length of body; baleen numerous; dorsal fin absent; pectoral appendages quadradactylous or pentadactylous; cleft of mouth a curved line; external throat grooves absent. Rostrum of skull convex in lateral view, small, attenuated when seen from above; supraorbital wings of frontals narrow; nasals subequal; cervical vertebrae fused; most ribs attached to vertebrae; lumbar vertebrae 10 or more.

KEY TO NORTH AMERICAN GENERA OF BALAENIDAE

1. Length of skull approximately 25 per cent of total length of animal; throat and chin black. *Eubalaena*, p. 839
1′. Length of skull approximately 40 per cent of total length of animal; throat and chin cream-colored. . . . . *Balaena*, p. 840

Genus Eubalaena Gray—Right Whales

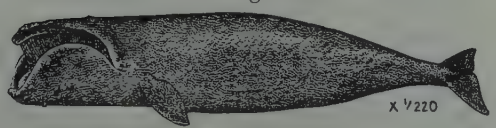
1864. *Eubalaena* Gray, Proc. Zool. Soc. London, p. 201, November. Type, *Balaena australis* Desmoulins.
1864. *Hunterus* Gray, Ann. Mag. Nat. Hist., ser. 3, 14:349, November. Type, *Hunterus Temminckii* Gray [= *Balaena glacialis* Borowski].
1866. *Hunterius* Gray, Catalogue of seals and whales in the British Museum, p. 78, an emendation of *Hunterus* Gray.

Total length to 70 ft. Blackish throughout except for whitish bellies in some individuals. Length of skull approximately ¼ of total length; skull arched more at base than at rostrum when viewed from side; depth of skull from most dorsal point on rostrum to most ventral point on mandible less than greatest depth of thorax; horny excrescence or "bonnet" on anterodorsal portion of head; plates of baleen numerous (at least 250), approximately 8 ft. long, blackish, central plates longest.

KEY TO NORTH AMERICAN SPECIES OF EUBALAENA

1. Total length 35–55 ft.; known from the Atlantic. . . . . *E. glacialis*, p. 839
1′. Total length 60–70 ft.; known from the Pacific. . . . . *S. sieboldii*, p. 840

Eubalaena glacialis (Borowski)
Atlantic Right Whale



1781. *Balaena glacialis* Borowski, Gemeinnüzzige Naturgeschichte des Thierreichs . . . , 2(1):18. Type locality, North Cape, Norway.
1900. *Eubalaena glacialis*, Kukenthal, Fauna Arct., 1:207.
1804. *Balaena nordcaper* Lacépède, Histoire naturelle des cétacées . . . , p. 103, pls. 2–3. Type locality, North Atlantic, between Spitzbergen, Norway and Iceland.
1860. *Balaena biscayensis* Eschricht, Revue et Mag. Zool., Paris, ser. 2, 12:229, May. Type locality, San Sebastián, Bay of Biscay, Spain.
1865. *Balaena cisarctica* Cope, Proc. Acad. Nat. Sci. Philadelphia, p. 168, August. Type locality, opposite Philadelphia, Pennsylvania.
1867. *Hunterius suedenborgii* Lilljeborg, Nova Acta Reg. Soc. Sci., Upsala, ser. 3, 6(2):35, pls. 9–11. Type locality, Wanga, West Gothland, Sweden.
1870. *Balaena britannica* Gray, Ann. Mag. Nat. Hist., ser. 4, 6:200, September. Type locality, off Lyme Regis, southern England.
1877. *Balaena tarentina* Capellini, Mem. Accad. Sci. Inst. Bologna, 8:9, pl. 1. Type locality, Gulf of Taranto, Italy.

See characters of genus and account of *E. sieboldii*, p. 840. This species inhabits subpolar and temperate waters, breeds in bays and inlets, and eats plankton. Females bear a single calf, which is nursed for approximately a year.

The slow-swimming Atlantic right whale, owing to its former abundance, great yield of oil and buoyancy of carcass, was for many years an attractive quarry for whalers along the coasts of New England and Newfoundland and in the Gulf of St. Lawrence.

RANGE.—Atlantic. Gulf of St. Lawrence and coast of Newfoundland, thence southward to coast of New England and, in winter, to Bermuda Islands and South Carolina.

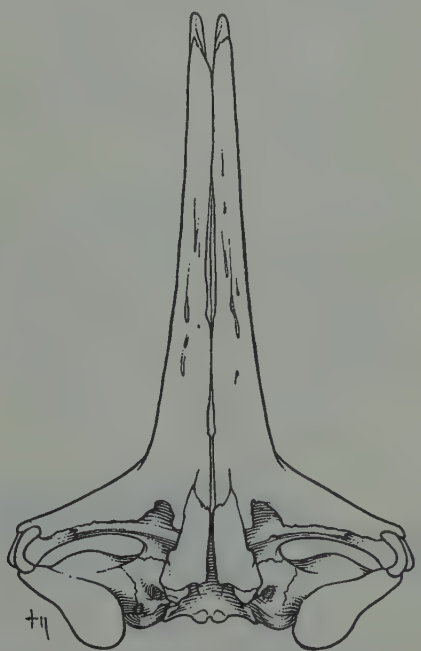


Fig. 463. *Eubalaena glacialis*, No. 23077 U.S.N.M., sex unknown. Ventral view, X 1/32.

Eubalaena sieboldii (Gray)
Pacific Right Whale

1818. *Balaena japonica* Lacépède, Mém. Mus. Hist. Nat., Paris, 4:473, a *nomen dubium*. Type locality, Japan.
1846. *Balaena Japonica* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):15, fig. 4, a renaming of a specimen referred to *Balaena australis* Temminck and Schlegel. Not Lacépède, 1818.
1864. *Balaena Sieboldii* Gray, Ann. Mag. Nat. Hist., ser. 3, 14:349, November. Type locality, coast of Japan and northwest coast of North America (Miller and Kellogg, Bull, U.S. Nat. Mus., 205:669, March 3, 1955).
1866. *Eubalaena Sieboldii* Gray, Catalogue of seals and whales in the British Museum, p. 96.

See characters of genus; differs from *E. glacialis* only in greater total length (see key), proportionally smaller "bonnet" and Pacific, rather than Atlantic, distribution. Pacific right whales inhabit subpolar and temperate waters, have been reported singly and in small gams, and eat plankton. Females normally give birth to a single calf, occasionally twins.

RANGE.—Pacific. Alaska: Aleutian Islands, thence southward to Baja California.

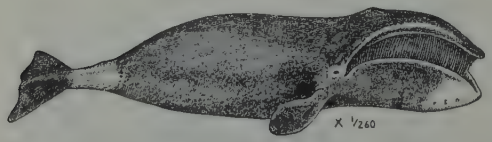
Genus Balaena Linnaeus—Bowhead Whale

1758. *Balaena* Linnaeus, Syst. nat., ed. 10, 1:75. Type, *Balaena mysticetus* Linnaeus.

Total length to 65 ft. Blackish throughout except for ash-colored area at tip of mandible, cream-colored throat and chin, and occasionally white underparts. Length of skull approximately 40 per cent of total length of animal; skull not abruptly arched when viewed from side; for other characters see account of the species.

Bowhead whales inhabit polar seas in summer, and subpolar and north-temperate waters in winter; seemingly mate in late summer; have 1 young (2 were seen with 1 female) after a gestation period of about 9½ months; and food consists of crustaceans, mollusks, and plankton. Formerly abundant, this whale has been extirpated over much of its former range and is now protected by international law. The genus is monotypic.

Balaena mysticetus Linnaeus
Bowhead Whale



1758. [*Balaena*] *mysticetus* Linnaeus, Syst. nat., ed. 10, 1:75. Type locality, Greenland Seas.
1874. *Balaena mysticetus roysii* Dall, *in* Scammon, Marine mammals . . . north-western coast of North America . . . . p. 305. Type locality, Okhotsk Sea.
1883. *Balaena mysticetus* forma *pitlekajensis* Malm, Bihang K. Svenska Vet. Akad. Handl., 8(4):37. Type locality, Pitlek, northeastern Siberia.

Fig. 464. *Balaena mysticetus*, 5 mi. off Iglurak Island, 20 mi. E Point Barrow, Alaska, No. 257313 U.S.N.M., ♀. Ventral view, X approximately 1/35.

Depth of skull from dorsalmost point on rostrum to ventralmost point on mandible more than greatest depth of thorax; anterodorsal part of head lacking "bonnet" seen in *Eubalaena;* approximately 360 plates of baleen, central ones longest (up to 12 feet); see other characters under account of genus.

RANGE.—Arctic and subarctic seas northward from the Pribilof Islands (Alaska) and the St. Lawrence River.

Order CARNIVORA—Carnivores

Size small (weasels) to large (bears); no fewer than 4 toes on each foot; toes having claws; P4 and m1, referred to as carnassial teeth, functioning much as do the 2 blades of scissors in cutting fibers of flesh that constitute the principal food of most kinds of carnivores (teeth of bears reflect their omnivorous food habits and carnassial teeth as such are not well developed in bears and in several genera of procyonids); upper tooth-row bent at union of P4 and M1 (straight in bears and in most Creodonta); condyle of lower jaw transverse; clavicle reduced or absent; stomach simple. The above combination of characters instead of any one character has to be used to distinguish carnivores from some kinds of mammals that are members of other orders.

Other characters include the following: canine teeth large, long, and recurved; three incisor teeth in each side of each jaw; outer incisor largest and inner one smallest; disparity in size of the three incisors greater in upper jaw than in lower jaw; diphodont (possessing milk teeth and permanent teeth); roots on both the milk teeth and permanent teeth; radius and ulna distinct; fibula slender and distinct from tibia; scaphoid and lunar bones of the wrist united into one; brain large and having deep convolutions.

Each major continent, even Australia, has one or more representatives of the order. Several of the genera have exceptionally extensive geographic ranges, for example *Canis, Felis,* and *Mustela.* The same can be said of several of the species of the mentioned genera. As is generally known, the more primitive living members of the order mostly are found in the southern parts of the major land areas. Examples include the mustelid genus *Lynchodon* and the ursid genus *Tremarctos* in South America, and perhaps the canid genus *Lycaon* of Africa.

The order Carnivora clearly is descended from the order Creodonta and more precisely from the family Miacidae. The subfamily Miacinae gave rise to the Procyonidae, Ursidae, and Canidae. The subfamily Viverravinae gave rise to the Viverridae, Hyaenidae, and Felidae. Exactly what the origin was of the Mustelidae remains to be determined. Some able students of mammalian phylogeny place the entire family Miacidae in the order Carnivora instead of in the order Creodonta.

The order Carnivora has provided modern man with three domestic, or at least semidomestic, mammals—the ferret, the cat, and the dog. By selective breeding, many color varieties of the mink (*Mustela vison*) and the red fox (*Vulpes fulva*) have been produced.

For man the Carnivora have provided more trouble in his pastoral enterprises than have any other mammals. Wolves in the early days and coyotes in later times levied on cattle and sheep, respectively, in the grazing areas of North America. In Australia the dingo is said to compete with man for mutton. In Africa the lion is always under pressure from the Masai in their area and his hope for survival lies in reserves set aside to preserve wildlife. North American hunters who take deer dislike the puma (mountain lion) and have helped to extirpate him in many regions. The outlook for the large carnivores is not good.

Key to North American Families of Carnivora

1. Digitigrade; caecum present;[1] longitudinal septa in tympanic bullae.
   2. Four digits on forefoot; entepicondylar foramen of humerus lacking; 3[2] lower molars. . . . . Canidae, p. 842
   2′. Five[3] digits on forefoot; entepicondylar foramen of humerus present; 1 or 2 lower molars.
      3. Molariform teeth $\frac{3-4}{3}$; trigonid of 1st lower molar lacking metaconid and therefore consisting of only 2 cuspids; posterior palatine foramina on or posterior to maxillopalatine suture. Felidae, p. 950
      3′. Molariform teeth $\frac{5-6}{4-6}$; trigonid of 1st lower molar having distinct metaconid and, therefore, a trigonid in fact; posterior palatine foramina anterior to maxillopalatine suture (nonnative). . . . . Viverridae, p. 950

1′. Plantigrade or subplantigrade; caecum absent; no longitudinal septa in tympanic bullae.
   4. Alisphenoid canal present; 3 lower molars; entepicondylar foramen in humerus absent; length of head and body more than 41 inches in adults; length of tail-vertebrae less than 14 per cent of total length. Ursidae, p. 865
   4′. Alisphenoid canal absent; 2 lower molars; entepicondylar foramen in humerus present;[4] length of head and body less than 41 inches in adults; length of tail-vertebrae more than 14 per cent of total length.
      5. Molars $\frac{1}{2}$;[5] cutting carnassial (except in *Enhydra*). . . . . Mustelidae, p. 897
      5′. Molars $\frac{2}{2}$; crushing carnassial. Procyonidae, p. 878

[1] The genus *Nandinia* of the Viverridae is said to lack a caecum.

[2] *Cyon* has only 2 lower molars.

[3] *Bdeogale* and *Suricata* of the Viverridae are said to have only four toes on the forefoot.

[4] The entepicondylar foramen in the Mustelidae is absent in some genera and present in others.

[5] Molars are $\frac{1}{1}$ in the genus *Mellivora.*

FAMILY CANIDAE—Wolves, Coyote, Dogs, and Foxes

Digitigrade, claws non-retractile, 4 or 5 front- and 4 hind-toes; long-legged and cursorial; rostrum of skull elongated; carnassials highly sectorial; tympanic bullae low, rarely much inflated; alisphenoid canal well developed; dental formula usually i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{2}{3}$, rarely with m. $\frac{2}{2}$ or m. $\frac{3-4}{4}$.

These cursorial carnivores occur on all continents. Even Australia has the dingo. It is so doglike that we suppose it first reached that continent in the canoes of prehistoric man. It is not surprising, therefore, that no fossil remains of an ancestral dingo have been found in Australian Tertiary beds.

Domestic dogs are thought to have been derived originally from the wolf stock.

Whereas any cat (family Felidae) stabs, clings, and stabs again—a mode of attack for which the cat's daggerlike canine teeth set in a short and broad rostrum, and the sharp and curved extensible claws, are well-suited—a canid snaps and slashes large-sized prey, quickly breaking away from its victim but repeatedly returning to snap and slash again. The canids are equipped with relatively long, recurved, sharp-pointed canine teeth near the end of a long, slender rostrum.

KEY TO NORTH AMERICAN GENERA OF CANIDAE

1. Molars $\frac{2}{2}$. . . . . *Speothos*, p. 864
1′. Molars $\frac{2}{3}$.
  2. Ventral border of dentary with prominent "step"; tail with mane of stiff black-tipped hairs on dorsal surface. . . *Urocyon*, p. 860
  2′. Ventral border of dentary without a prominent "step"; tail without mane.
    3. Postorbital processes thickened and convex dorsally; upper incisors prominently lobed; basilar length usually more than 147. . . . . *Canis*, p. 842
    3′. Postorbital processes thin and concave dorsally; upper incisors usually not prominently lobed; basilar length usually less than 147.
      4. Ears long and pointed; rostrum relatively narrow, its width, measured at a point opposite the cone of P2 less than 18 per cent of condylobasal length; teeth of rami relatively widely spaced, anteroposterior diameter of i1 at base usually less than distance between alveoli of i1 and c. . . *Vulpes*, p. 855
      4′. Ears short and rounded; rostrum relatively broad, its width measured at a point opposite the cone of P2 more than 18 per cent of condylobasal length; teeth of rami relatively closely spaced, anteroposterior diameter of i1 greater than distance between alveoli of i1 and c. . . . . *Alopex*, p. 853

Genus Canis Linnaeus—Coyote, Dogs, and Wolves

1758. *Canis* Linnaeus, Syst. nat., ed. 10, 1:38. Type, *Canis familiaris* Linnaeus.
1837. *Vulpecanis* Blainville, Ann. Sci. Nat., Paris, Zool. 8(2):279. Type, *Canis aureus* Linnaeus.
1839. *Lyciscus* Hamilton-Smith, *in* The naturalist's library (edit. Jardine), 25:160. Type, *Canis latrans* Say.
1839. *Sacalius* Hamilton-Smith, The naturalist's library (edit. Jardine), 25:214. Type, *Canis aureus* Linnaeus.
1841. *Oxygoüs* Hodgson, Calcutta Jour. Nat. Hist., 2:213. Type, *Oxygoüs indicus* Hodgson.
1855. *Lupulus* Gervais, Histoire naturelle des mammifères, 2:60–62. Based on *Canis aureus* Linnaeus and others. Not *Lupulus* Blainville, 1843.
1869. *Dieba* Gray, Catalogue of carnivorous, pachydermatous, and edentate Mammalia in the British Museum, p. 180. Type, *Canis anthus* Cuvier, 1820 [= *Canis aureus* Linnaeus].
1906. *Lupulella* Hilzheimer, Zool. Beobachter, 47:363. Type, *Canis mesomelas* Schreber, 1778.
1906. *Schaeffia* Hilzheimer, Zool. Beobachter, 47:364. Type, *Canis adustus* Sundevall, 1846.
1906. *Alopedon* Hilzheimer, Zool. Beobachter, 47:365. Type, *Canis thooides* Hilzheimer [= *Canis anthus* Cretzschmar, not *C. anthus* Cuvier, 1820].

Size medium to large, adults usually more than 18 lbs.; tail bushy, cylindrical, and of greatest diameter at the middle; postorbital processes convex above, evenly continuous with inflated frontal area; temporal ridges uniting to form a sagittal crest; inferior margin of lower jaw without prominent step.

KEY TO NORTH AMERICAN SPECIES OF CANIS

1. Nose pad 1 in. or less in diameter; heel pad less than 1¼ in. in diameter; anteroposterior diameter of canine less than 11 mm.; tips of upper canines usually extending below level of a line connecting mental foramina when mandible is in place; cheek-teeth relatively narrow; rostrum relatively narrow; tail usually held low when animal is running. *C. latrans*, p. 843
1′. Nose pad 1 in. or more in diameter; heel pad more than 1¼ in. in diameter; anteroposterior diameter of canine more than 11 mm.; tips of upper canines usually not extending below a line connecting mental foramina when mandible is in place; cheek-teeth relatively broad; rostrum relatively broad; tail usually held high when animal is running.

2. Larger; condylobasal length of males more than 213 mm., condylobasal length of females more than 203 mm.; teeth relatively broad; cingulum on outer edge of M1 not conspicuous; not recorded from Arkansas, eastern Oklahoma, eastern Texas, or other states bordering on the Gulf of Mexico. . . . . *C. lupus*, p. 847

2′. Smaller; condylobasal length of males less than 235 mm.; condylobasal length of females less than 215 mm.; teeth relatively narrow; cingulum on outer edge of M1 conspicuous; recorded from Indiana, Illinois, Missouri, Georgia, southern Tennessee, eastern Oklahoma, Arkansas, and states of the U.S. bordering on the Gulf of Mexico. . . . . *C. niger*, p. 851

Canis latrans
Coyote

Revised by Jackson, Classification in the races of the coyote, pt. 2, pp. 229–341, figs. 20–28, pls. 58–81, *in* Young and Jackson, The clever coyote, Wildlife Manag. Inst., Washington, D.C., pp. xv + 411, 81 pls., 28 figs., 1951.

External measurements: 1052–1320; 300–394; 177–220. Condylobasal length of skull, 160.2–203.5. Nose pad (rhinarium) averaging 25 mm. or less in diameter; canines relatively long and narrow, tips of C1 extending below the level of the anterior mental foramina when lower jaw is in place; anteroposterior diameter of C1 at base less than 11 mm.; premolars relatively widely spaced; teeth relatively narrow; distance from posterior border of alveolus of M2 to anterior border of alveolus of P1 3.1 or more times distance between medial borders of alveoli of P1s. Tail directed downward when animal runs.

The mating season of the coyote is usually from February to April. The gestation period is 60 to 65 days. Litters contain an average of 5.7 young.

Map No. 443 does not show record stations of occurrence in several parts of the eastern United States where the presence of the coyote is thought to have resulted from introductions of the animals by man. Schultz (1955:44–46) mentions such occurrences in West Virginia, Virginia, North Carolina, South Carolina, Georgia, Mississippi, Alabama, and lists in detail occurrences in Tennessee.

Canis latrans cagottis (Hamilton-Smith)

1839. *Lyciscus cagottis* Hamilton-Smith, *in* The naturalist's library (edit. Jardine), 25:164, type from Río Frío, W slope Mt. Iztaccíhuatl, México.
1932. *Canis latrans cagottis*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.

MARGINAL RECORDS (Jackson, 1951:309, unless otherwise noted).—San Luis Potosí: Hacienda La Parada. Veracruz: 20 km. W Piedras Negras, 400 ft., on Río Blanco. Oaxaca: Cerro San Felipe. México: *type locality*. Michoacán: 15 mi. NE Morelia (Hall and Villa, 1950:182).

Canis latrans clepticus Elliot

1903. *Canis clepticus* Elliot, Field Columb. Mus., Publ. 79, Zool. Ser., 3:225, August 15, type from Vallecitos, Sierra San Pedro Mártir, 8500 ft., Baja California.
1932. *Canis latrans clepticus*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.

MARGINAL RECORDS (Jackson, 1951:295).—California: San Marcos; Julian; Jacumba. Baja California: San Felipe; La Grulla; San Quintín.

Canis latrans dickeyi Nelson

1932. *Canis latrans dickeyi* Nelson, Proc. Biol. Soc. Washington, 45:224, November 26, type from Cerro Magote, 2 mi. W Río Gaoscorán, District of La Unión, El Salvador.

MARGINAL RECORDS.—El Salvador: type locality. Costa Rica (Goodwin, 1946:439): Miravalles; Bebedero; Nicoya.

Canis latrans frustror Woodhouse

1851. *Canis frustror* Woodhouse, Proc. Acad. Nat. Sci. Philadelphia, 5(1850–1851):147, June 30, type from Red Fork of Arkansas River, probably near 97° W Long., near present town of Perkins, Payne Co., now Cimarron River, Oklahoma, about 100 mi. W Fort Gibson, Oklahoma.
1951. *Canis latrans frustror*, Jackson, *in* Young and Jackson, The clever coyote, p. 271.

MARGINAL RECORDS (Jackson, 1951:274–275).—Missouri: Madisonville; Barren. Arkansas: Three Brothers; Ashdown. Texas: Van Zandt County; Dayton; Aransas National Wildlife Refuge; Baby Head; *Cherokee*; Murray. Oklahoma: Wichita Mts. Wildlife Refuge; Calumet; type locality. Kansas: Hamilton; Eudora. Missouri: Randolph County.

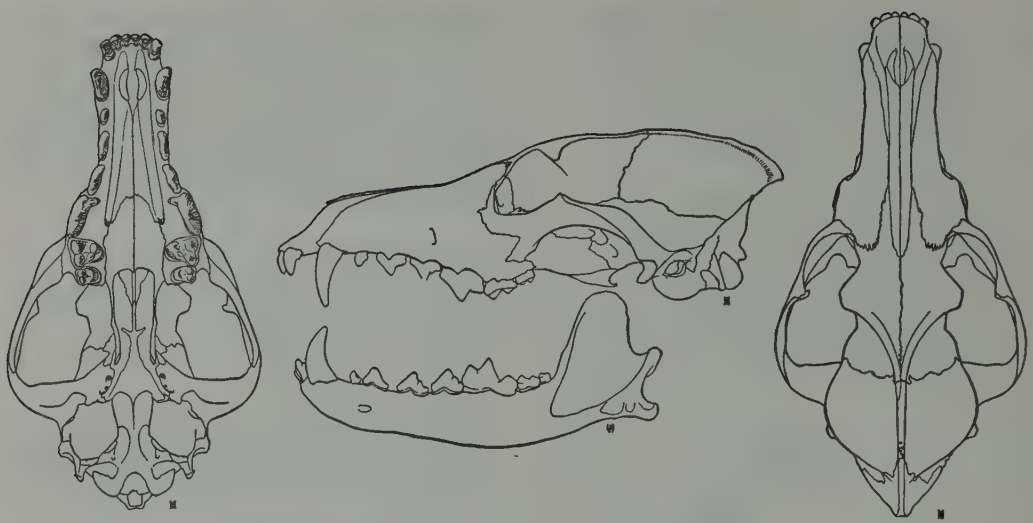


Fig. 465. *Canis latrans lestes*, 5 mi. SE Fallon, Nevada, No. 89940 M.V.Z., ♂, X ⅔.

Canis latrans goldmani Merriam

1904. *Canis goldmani* Merriam, Proc. Biol. Soc. Washington, 17:157, October 6, type from San Vicente, Chiapas. Known only from the type locality.
1932. *Canis latrans goldmani*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.

Canis latrans hondurensis Goldman

1936. *Canis hondurensis* Goldman, Jour. Washington Acad. Sci., 26:33, January 15, type from Cerro Quinote, NE Archaga, on Talanga Road, N Tegucigalpa, Honduras.
1951. *Canis latrans hondurensis*, Jackson, *in* Young and Jackson, The clever coyote, p. 313.

MARGINAL RECORDS.—Honduras: type locality; *La Cueva* (*Archaga, Department of Tegucigalpa*) (Jackson, 1951:315).

Canis latrans impavidus J. A. Allen

1903. *Canis impavidus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:609, November 12, type from Río de las Bocas, northwestern Durango.
1932. *Canis latrans impavidus*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.

MARGINAL RECORDS (Jackson, 1951:307).—Sonora: Camoa (Río Mayo). Durango: Villa Ocampo. Zacatecas: Fresnillo. Sinaloa: Escuinapa. Baker (1956:293) identifies specimens as *mearnsi* from southern Coahuila, whereas our earlier prepared map, 443, suggests that *impavidus* occurs there.

Canis latrans incolatus Hall

1934. *Canis latrans incolatus* Hall, Univ. California Publ. Zool., 40:369, November 5, type from Isaacs Lake, 3000 ft., Bowron Lake region, British Columbia.

MARGINAL RECORDS (Jackson, 1951:266, unless otherwise noted).—Alaska: Point Barrow (Jackson, 1951: 263). Mackenzie: Mackenzie River Delta (Anderson, 1947: 52); near Providence. Alberta: Fort Smith; *near Murdock Creek*; 20 mi. S Athabaska Landing; 15 mi. S Henry House. British Columbia: Shuswap (J. A. Allen, 1908:585); *Ashcroft* (*ibid.*); Pemberton (Racey and Cowan, 1935:H22); west branch Homalko River (Hall, 1934:370); Stuie; Ootsa Lake; Spruce Mtn. Alaska: near Whitehorse, Alsek River (J. A. Allen, 1908:585); Copper River Flat, 20 mi. from Cordova; Kenai Lake; Wonder Lake, Mt. McKinley region; Kotzebue. Not located: Alaska: Big Delta River; Eagle River; Healy. Alberta: Whitemud.

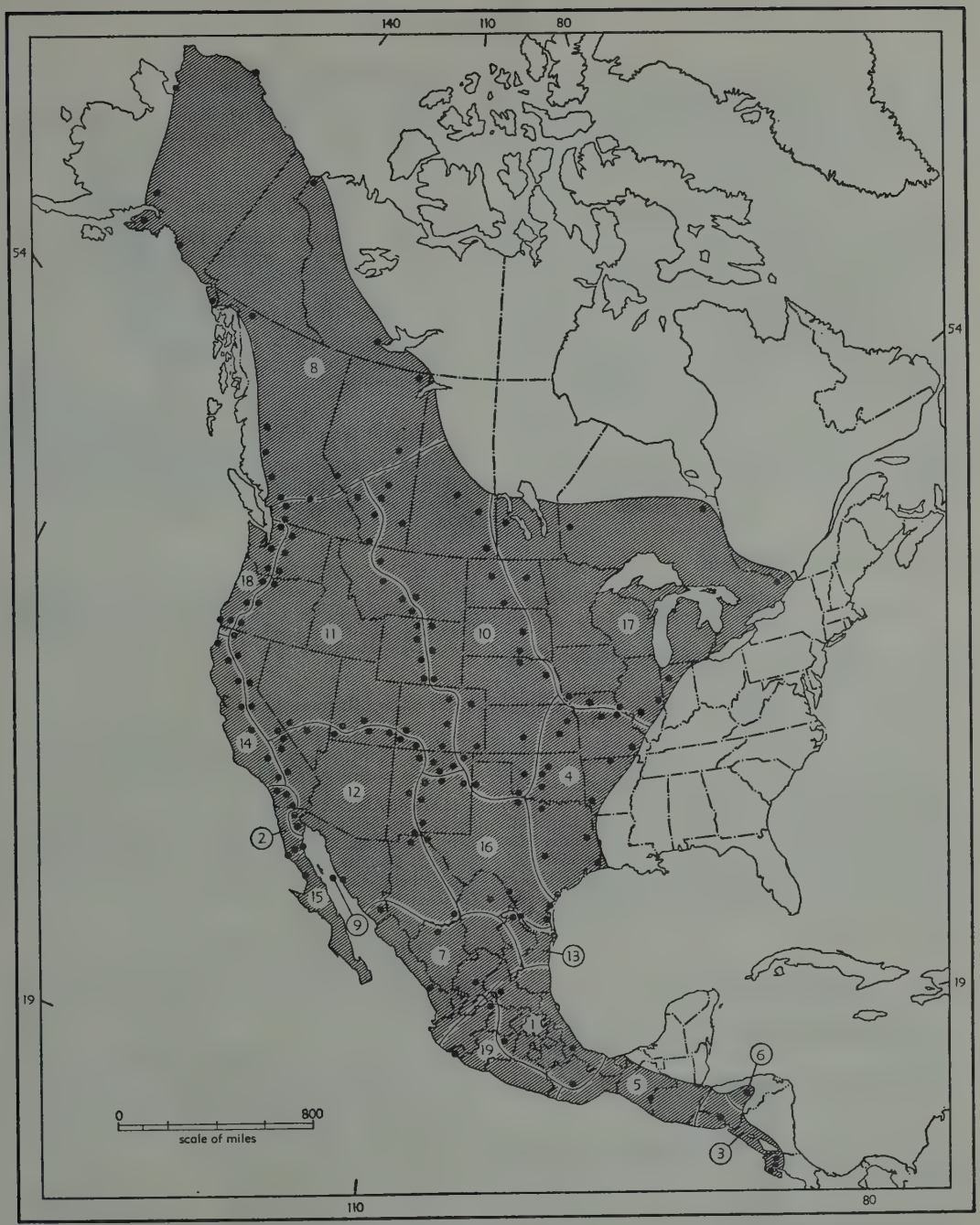
Canis latrans jamesi Townsend

1912. *Canis jamesi* Townsend, Bull. Amer. Mus. Nat. Hist., 31:130, June 14, type from Tiburón Island, Baja California. Known only from the type locality.
1932. *Canis latrans jamesi*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.

Canis latrans latrans Say

1823. *Canis latrans* Say, *in* Long, Account of an exped. . . . to the Rocky Mts. . . . , 1:168, type from Engineer Cantonment, about 12 mi. SE of the present town of Blair, Washington Co., Nebraska, on the W bank of the Missouri River.
1897. *Canis pallidus* Merriam, Proc. Biol. Soc. Washington, 11:24, March 15, type from Johnstown, Brown Co., Nebraska. Not *Canis pallidus* Cretzschmar, 1826, type from Kardofan, North Africa, *qui Vulpes pallida*.
1898. *Canis nebracensis* Merriam, Science, n. s., 8:782, December 2, a renaming of *Canis pallidus* Merriam, 1897.

MARGINAL RECORDS (Jackson, 1951:261–262).—Saskatchewan: Prince Albert National Park; Melfort; Windhorst. North Dakota: Shell Creek; Palace Buttes, 6 mi. N Cannonball. South Dakota: Crow Creek Reservation; Fort Randall. Nebraska: Johnstown; Beemer; *type locality*. Kansas: Fort Larned. Oklahoma: Anthon; Frederick. Texas: 70 mi. W Amarillo. New Mexico: Des Moines. Colorado: 25 mi. NW Estelene; Brush; *Pawnee Buttes*. Wyoming: Shirley; Casper; 20 mi. N Arvada. Montana: *Lodge Grass*; Delphia; Conrad. Alberta: Buffalo; Red Deer; Lacombe.—Findley (1956b:29) records from *Clay County*, South Dakota, after Map 443 was drawn.



Map 443. *Canis latrans.*

Guide to subspecies

1. *C. l. cagottis*
2. *C. l. clepticus*
3. *C. l. dickeyi*
4. *C. l. frustror*
5. *C. l. goldmani*
6. *C. l. hondurensis*
7. *C. l. impavidus*
8. *C. l. incolatus*
9. *C. l. jamesi*
10. *C. l. latrans*
11. *C. l. lestes*
12. *C. l. mearnsi*
13. *C. l. microdon*
14. *C. l. ochropus*
15. *C. l. peninsulae*
16. *C. l. texensis*
17. *C. l. thamnos*
18. *C. l. umpquensis*
19. *C. l. vigilis*

Canis latrans lestes Merriam

1897. *Canis lestes* Merriam, Proc. Biol. Soc. Washington, 11:25, March 15, type from Toyabe Mts., near Cloverdale, Nye Co., Nevada.
1913. *Canis latrans lestes*, Grinnell, Proc. California Acad. Sci., ser. 4, 3:285, August 28.

MARGINAL RECORDS (Jackson, 1951:282–287).—Alberta: Eagle Pass, head James River; Calgary; *New Oxley*; Waterton Lakes National Park. Montana: *Camas Creek*, *Glacier Park*; Little Belt Mts.; Wallis; Bridger. Wyoming: Big Horn; Kirby Creek; Rongis; Big Creek P.O. Colorado: Loveland; *Boulder*; Tarryall P.O.; *Salida*; Rio Grande. New Mexico: Hall's Peak; Santa Fe Forest; Abiquiu. Colorado: Coventry. Utah: Dark Valley, 5 mi. SW Teasdale; *Panguitch*; Parowan. Nevada: Silver Peak Mts. California: Deep Spring Lake; Wawona; Clipper Gap; Glade; *Winthrop*; Gottville. Oregon: Harriman; Bend; *Hay Creek*; Sink. Washington: Goldendale; Ellensberg; *Cashmere*; Lake Chelan; *Conconully*. British Columbia: Roche River; Spence's Bridge; Shuswap. Cowan and Guiguet (1956:279) separate the geographic range of *lestes* along the 52nd parallel from that of *incolatus* to the north, whereas Jackson (1951) indicates that the separation is along the 51st parallel.

Canis latrans mearnsi Merriam

1897. *Canis mearnsi* Merriam, Proc. Biol. Soc. Washington, 11:30, March 15, type from Quitobaquito, Pima Co., Arizona.
1932. *Canis latrans mearnsi*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.
1897. *Canis estor* Merriam, Proc. Biol. Soc. Washington, 11: 31, March 15, type from Noland's Ranch, San Juan River Valley, San Juan Co., Utah.

MARGINAL RECORDS (Jackson, 1951:300–302).—Utah: La Sal. Colorado: Dolores; Pagosa. New Mexico: El Vado; Magdalena; 15 mi. W El Paso. Chihauhua: Lake Santa Maria; Lake Palomas. Sonora: Costa Rica Ranch. Baja California: 80 mi. S. Mexicali; east base Laguna Hanson Mts. California: Hesperia; Coso; Independence. Nevada: Oak Springs. Utah: New Castle; Mt. Ellen, Henry Mts. Baker (1956:293) identifies specimens as *mearnsi* from southern Coahuila, whereas our earlier prepared map, 443, suggests that *impavidus* occurs there.

Canis latrans microdon Merriam

1897. *Canis microdon* Merriam, Proc. Biol. Soc. Washington, 11:29, March 15, type from Mier, on Río Grande, Tamaulipas.
1932. *Canis latrans microdon*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.

MARGINAL RECORDS (Jackson, 1951:305).—Nuevo León: Rodríguez [= Anahuac]. Texas: *Roma*. Tamaulipas: Bagdad; *Matamoros*.

Canis latrans ochropus Eschscholtz

1829. *Canis ochropus* Eschscholtz, Zoologischer Atlas . . . , 3:1, type from Sacramento River Valley, not far south of Sacramento, Sacramento Co., California.
1932. *Canis latrans ochropus*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.

MARGINAL RECORDS (Jackson, 1951:293).—California: Maple Creek; Chico; Wheatland; Mariposa County; Orosi; Onyx; San Jacinto.

Canis latrans peninsulae Merriam

1897. *Canis peninsulae* Merriam, Proc. Biol. Soc. Washington, 11:28, March 15, type from Santa Anita, Cape Saint Lucas, Baja California.
1932. *Canis latrans peninsulae*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.

MARGINAL RECORDS (Jackson, 1951:297).—Baja California: Playa María Bay; thence south throughout the rest of the peninsula.

Canis latrans texensis V. Bailey

1905. *Canis nebrascensis texensis* V. Bailey, N. Amer. Fauna, 25:175, October 24, type from 45 mi. SW Corpus Christi at Santa Gertrudis, Kleberg Co., Texas.
1932. *Canis latrans texensis* V. Bailey, N. Amer. Fauna, 53:312, March 11.

MARGINAL RECORDS (Jackson, 1951:278–279).—New Mexico: Cowles; Tucumcari. Texas: Vernon; Nueces Bay; 50 mi. N Brownsville. Tamaulipas: Nuevo Laredo. Texas: Eagle Pass. Coahuila: 25 mi. NW Muzquiz. Texas: El Paso. New Mexico: Organ Mts.; Carthage; Isleta.

Canis latrans thamnos Jackson

1949. *Canis latrans thamnos* Jackson, Proc. Biol. Soc. Washington, 62:31, March 17, type from Basswood Island, Apostle Islands, Ashland Co., Wisconsin.

MARGINAL RECORDS (Jackson, 1951:269–271).—Manitoba: Kenville. Ontario: Ghost Narrows, Lac Seul; Smoky Falls; Dunrobin, 25 mi. W Ottawa. Indiana: McCoysburg. Illinois: Douglas County; Macoupin County. Missouri: Spencerberg; Carollton; Tarkio. North Dakota: Sullys Hill National Park.

Canis latrans umpquensis Jackson

1949. *Canis latrans umpquensis* Jackson, Proc. Biol. Soc. Washington, 62:31, March 17, type from 5 mi. SE Drew, Douglas Co., Oregon.

MARGINAL RECORDS (Jackson, 1951:290).—Washington: Nooksack River; Renton; Trout Lake. Oregon: Marmot; *Blue River*; 20 mi. SE Oakridge; Ashland; Pyramid Rock, Pistol River, 12 mi. from mouth.

Canis latrans vigilis Merriam

1897. *Canis vigilis* Merriam, Proc. Biol. Soc. Washington, 11:33, March 15, type from Manzanillo, Colima.
1932. *Canis latrans vigilis*, Nelson, Proc. Biol. Soc. Washington, 45:224, November 26.

MARGINAL RECORDS.—Jalisco: Ojo de Agua, Tepic (J. A. Allen, 1906:253). Colima: type locality.

Canis lupus
Gray Wolf

Revised by Goldman (Classification of wolves, pt. 2, pp. 389–507, in part, pls. 88–125, 131, 1 fig. in text), *in* Young and Goldman, The wolves of North America, Amer. Wildlife Inst., Washington, D. C., pp. xx + 636, 131 pls., 15 figs. in text, 1944.

External measurements: 1003–2046; 356–500; 220–310. Condylobasal length of skull, 203.3–269.3. Nose pad (rhinarium) averaging 31 mm. or more in diameter; C1 more than 12 mm. in anteroposterior diameter at base, C1 not extending below level of anterior mental foramen when lower jaw is in place; premolars relatively closely spaced; teeth relatively broad; color varying from nearly black to white, some shade of gray in most subspecies. In life, tail usually carried horizontally or directed upward when animal runs.

An average of 7 whelps are born in April, May, or June, after a gestation period of 60 to 63 days. Wolves become sexually mature when between 2 and 3 years of age.

Canis lupus alces Goldman

1941. *Canis lupus alces* Goldman, Proc. Biol. Soc. Washington, 54:109, September 30, type from Kachemak Bay, Kenai Peninsula, Alaska. Known only from the type locality.

Canis lupus arctos Pocock

1935. *Canis lupus arctos* Pocock, Proc. Zool. Soc. London, p. 682, September 12, type from Melville Island, Franklin.

MARGINAL RECORDS (Anderson, 1947:53).—Ellesmere Island: Discovery Bay; Eureka Sound; Bear Peninsula. Melville Island: type locality. *Sverdrup Islands.*

Canis lupus baileyi Nelson and Goldman

1929. *Canis nubilus baileyi* Nelson and Goldman, Jour. Mamm., 10:165, May 9, type from Colonia García (about 60 mi. SW Casas Grandes), Chihuahua.
1937. *Canis lupus baileyi*, Goldman, Jour. Mamm., 18:45, February 14.

MARGINAL RECORDS (Goldman, 1944:471, unless otherwise noted).—New Mexico: Hatch. Texas: 16 mi. NW Fort Davis. San Luis Potosí: Bledos (Dalquest, 1953b:173). Durango: El Salto. Chihuahua: Sierra Madre near Guadalupe y Calvo. Arizona: Arivaca; Helvetia; Fort Bowie.

Canis lupus beothucus G. M. Allen and Barbour

1937. *Canis lupus beothucus* G. M. Allen and Barbour, Jour. Mamm., 18:230, May 12, type from Newfoundland. Known only from Newfoundland; now extinct.

Canis lupus bernardi Anderson

1943. *Canis lupus bernardi* Anderson, Jour. Mamm., 24:389, August 17, type from Cape Kellett, southwestern part of Banks Island, Franklin, lat. about 72° N, long. 125° W. Known only from the type locality.
1943. [*Canis lupus*] *banksianus* Anderson, Jour. Mamm., 24: 390, August 17, an accidental renaming of *C. l. bernardi* Anderson.

Canis lupus columbianus Goldman

1941. *Canis lupus columbianus* Goldman, Proc. Biol. Soc. Washington, 54:110, September 30, type from Wistaria, N side Ootsa Lake, British Columbia.

MARGINAL RECORDS (Cowan and Guiguet, 1956:283, unless otherwise noted).—Yukon: Lapie Lake, Mile 105, Canol Road (Rand, 1945a:34). British Columbia: 94 mi. S Fort Nelson; Cache Creek; Barkerville. Alberta: Jasper National Park (Anderson, 1943:390). British Columbia: Avola; Kettle River (Goldman, 1944:452); Roche River, tributary of the Similkameen River (*ibid.*); near Hope; *Pemberton* (Goldman, 1944:452, but later, by Cowan and Guiguet, 1956:283, recorded as *fuscus*); Atnarko; Prince Rupert; 60 mi. S Telegraph Creek (Goldman, 1944:452); Telegraph Creek; Atlin.

Canis lupus crassodon Hall

1932. *Canis occidentalis crassodon* Hall, Univ. California Publ. Zool., 38:420, November 8, type from Tahsis Canal, Nootka Sound, Vancouver Island, British Columbia.
1937. *Canis lupus crassodon*, Goldman, Jour. Mamm., 18:45, February 11.

MARGINAL RECORDS (Goldman, 1944:460).—Vancouver Island: Quatsino; Cowichan Lake.

Canis lupus fuscus Richardson

1839. *Canis lupus* var. *fusca* Richardson, *in* Beechey, The zoology of Captain Beechey's voyage in His Majesty's Blossom . . . , p. 5. Type locality, banks of the Columbia River, below The Dalles, between Oregon and Washington.
1850. *Lupus gigas* Townsend, Acad. Nat. Sci. Philadelphia, 2:75, November, type from near Vancouver, Clark Co., Washington.

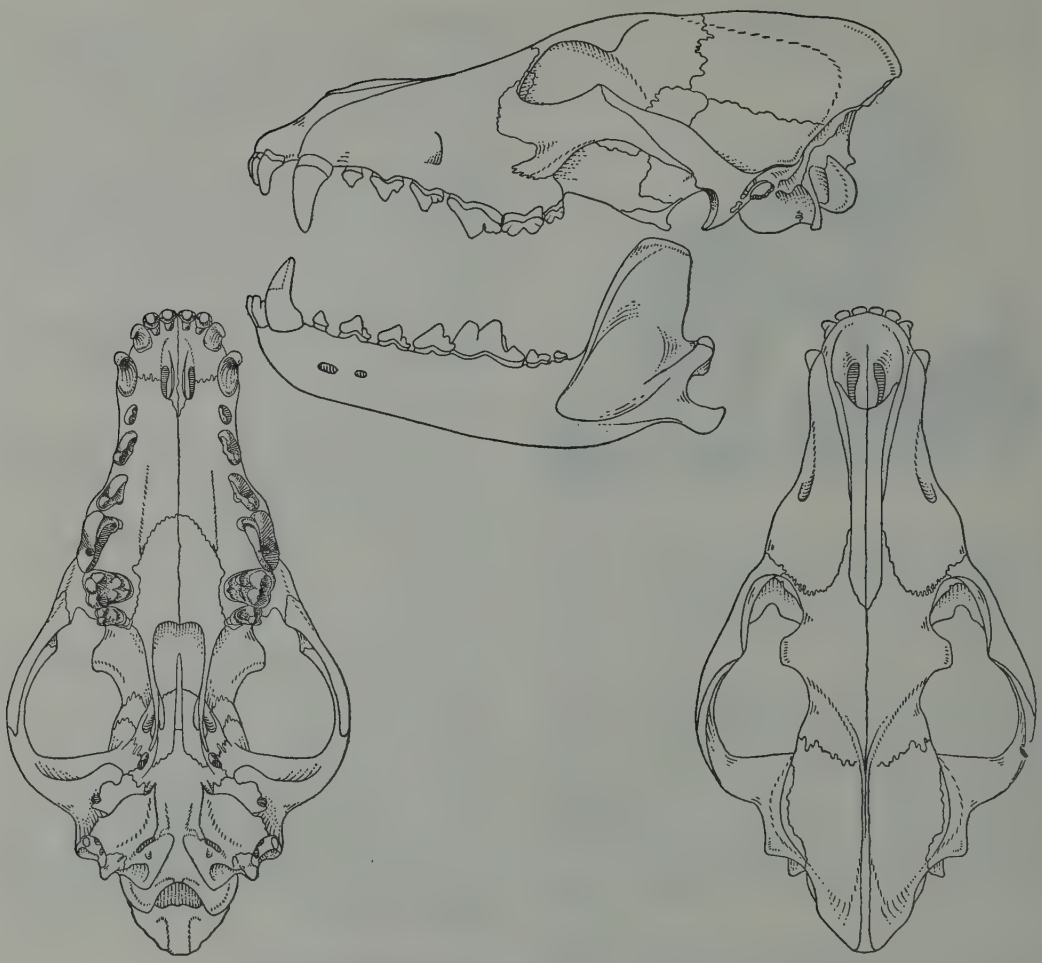


Fig. 466. *Canis lupus tundrarum*, Wahoo Lake, long. 146° 58′ W, lat. 69° 08′ N, Alaska, No. 51561 K.U., ♀, X ⅝.

MARGINAL RECORDS (Goldman, 1944:458, unless otherwise noted).—British Columbia: Kimsquit, at head of Dean Channel (Anderson, 1947:54); Daisy Lake (Cowan and Guiguet, 1956:284). Washington: Twin Peaks; type locality. Oregon: South Ice Cave, about 40 mi. S Bend (Bailey, 1936:275); Sycan, 30 mi. S Silver Lake. Nevada: Little High Rock Canyon (Hall, 1946:269). California: Litchfield. Oregon: Crane Prairie, 25 mi. NE Ashland, thence up coast to British Columbia: Swindle Island.

Canis lupus hudsonicus Goldman

1941. *Canis lupus hudsonicus* Goldman, Proc. Biol. Soc. Washington, 54:112, September 30, type from head of Shultz Lake, Keewatin.

MARGINAL RECORDS.—Keewatin: Perry River District, Queen Maud Sea (Gavin, 1945:229); Wager River (Goldman, 1944:229); Cape Fullerton (Anderson, 1947:54); *Hudson Bay* (Goldman, 1944:429). Mackenzie: Artillery Lake (Anderson, 1947:54); Back River, 20 mi. below Lake Beechey (*ibid.*).

Canis lupus griseoalbus Baird

1823. *Canis Lupus-Griseus* Sabine, *in* Franklin, Narrative of a journey to the shores of the Polar Sea in . . . 1819–22, p. 654 (Appendix). Not *Canis Griseus* Boddaert, 1794.
1858. *Canis occidentalis* var. *griseo-albus* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):104, July 14, type from Cumberland House, Saskatchewan.

1952. *Canis lupus griseoalbus*, Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:338, December 5.
1947. *Canis lupus knightii* Anderson, Bull. Nat. Mus. Canada, 102:54, January 24, type from Cumberland House, Saskatchewan.

MARGINAL RECORDS (Anderson, 1947:54, unless otherwise noted).—Saskatchewan: type locality. Manitoba: Norway House (Hall and Kelson, 1952:340); Riding Mountain National Park. Saskatchewan: about Carlton; Prince Albert National Park.

Map 444. *Canis lupus.*

1. *C. l. alces*
2. *C. l. arctos*
3. *C. l. baileyi*
4. *C. l. beothucus*
5. *C. l. bernardi*
6. *C. l. columbianus*
7. *C. l. crassodon*
8. *C. l. fuscus*
9. *C. l. hudsonicus*
10. *C. l. griseoalbus*
11. *C. l. irremotus*
12. *C. l. labradorius*
13. *C. l. ligoni*
14. *C. l. lycaon*
15. *C. l. mackenzii*
16. *C. l. manningi*
17. *C. l. mogollonensis*
18. *C. l. monstrabilis*
19. *C. l. nubilus*
20. *C. l. occidentalis*
21. *C. l. orion*
22. *C. l. pambasileus*
23. *C. l. tundrarum*
24. *C. l. youngi*

Canis lupus irremotus Goldman

1937. *Canis lupus irremotus* Goldman, Jour. Mamm., 18: 41, February 14, type from Red Lodge, Carbon Co., Montana.

MARGINAL RECORDS (Goldman, 1944:448–449, unless otherwise noted).—Alberta: Calgary (Cowan, 1947: 141); Gleichen (*ibid.*). Montana: Fort Conrad; Ingomar; Powderville. South Dakota: Belle Fourche. Wyoming: 15 mi. NW Manville; Split Rock; Cokeville. Idaho: Castleford; Hammett; Boise National Forest. Oregon: Logan Valley (V. Bailey, 1936:275, recorded under the name *Canis lycaon nubilus*). Idaho: Priest River. Alberta: Waterton Lakes National Park (Rand, 1948b:113).

Canis lupus labradorius Goldman

1937. *Canis lupus labradorius* Goldman, Jour. Mamm., 18: 38, February 11, type from vicinity of Fort Chimo (now Chimo), Quebec.

MARGINAL RECORDS (Goldman, 1944:435).—Quebec: type locality. Labrador: Porcupine, near Cartwright.

Canis lupus ligoni Goldman

1937. *Canis lupus ligoni* Goldman, Jour. Mamm., 18:39, February 11, type from head of Duncan Canal, Kupreanof Island, Alaska.

MARGINAL RECORDS (Goldman, 1944:455, unless otherwise noted).—Alaska: Eleanor Cove, Yakutat Bay; Juneau. British Columbia: Port Simpson (Anderson, 1947: 55). Alaska: Dall Island (G. M. Allen, 1942a:210); Kuiu Island.

Canis lupus lycaon Schreber

1775. *Canis lycaon* Schreber, Die Säugthiere . . . , theil 2, heft 13, pl. 89. Type locality, Quebec, Quebec (fixed by Goldman, Jour. Mamm., 18:38, February 11, 1937).
1937. *Canis lupus lycaon*, Goldman, Jour. Mamm., 18:45, February 11.
1843. *Canis lupus canadensis* Blainville, Ostéographie ou description iconographique . . . , vol. 2, fasc. 13 (Atlas), Genre Canis, p. 45, pl. 7, based on a specimen presumably from Canada.
1940. *Canis tundrarum ungavensis* Comeau, Ann. de l'Acfas, 6:121, Montreal, June 15, type from 35 mi. N Godbout, Quebec.

MARGINAL RECORDS (Goldman, 1944:440–441, unless otherwise noted).—Quebec: 50 mi. N Quebec, thence southward to northeastern *Florida*. Tennessee: Hamilton County. Minnesota: Elk River. Ontario: Rainy Lake (Anderson, 1947:55); Hurkett, Thunder Bay; 40 mi. NE Mattawa. Extinct over most of the southern part of this range.

Canis lupus mackenzii Anderson

1823. *Canis Lupus-Albus* Sabine, *in* Franklin, Narrative of a journey to the shores of the Polar Sea in . . . 1819–22, p. 655 (Appendix), and plate opposite p. 312. Type from Fort Enterprise, Mackenzie. Not *C*[*anis*]. *Lupus albus* Kerr, 1792.
1943. *Canis lupus mackenzii* Anderson, Jour. Mamm., 24: 388, August 17, type from Imnanuit, west of Kater Point, Bathurst Inlet, lat. 67° 44′ 20″ N, long. 109° 04′ 03″ W, Mackenzie.

MARGINAL RECORDS (Goldman, 1944:476, unless otherwise noted).—Mackenzie: type locality; upper Back River (Anderson, 1947:55); Reliance, Great Slave Lake; Fort Good Hope; Peel River.

Canis lupus manningi Anderson

1943. *Canis lupus manningi* Anderson, Jour. Mamm., 24: 392, August 17, type from Hantzch River, east side of Foxe Basin, west side of Baffin Island, lat. about 67° N, long. 24° W, Franklin.

MARGINAL RECORDS (Anderson, 1943:393).—Baffin Island: Salmon River, Pond Inlet, about 72° 30′ N; Ashe Inlet, Hudson Strait.

Canis lupus mogollonensis Goldman

1937. *Canis lupus mogollonensis* Goldman, Jour. Mamm., 18:43, February 11, type from S. A. Creek, 10 mi. NW Luna, Catron Co., New Mexico.

MARGINAL RECORDS (Goldman, 1944:466).—Arizona: Kendrick Peak. New Mexico: type locality; Magdalena; Monticello; Capitan Mts.; Hurley. Arizona: Galiuro Mts.; Aguila.

Canis lupus monstrabilis Goldman

1937. *Canis lupus monstrabilis* Goldman, Jour. Mamm., 18: 42, February 11, type from 10 mi. S Rankin, Upton Co., Texas.

MARGINAL RECORDS (Goldman, 1944:468).—Texas: Fort Richardson; Llano. Tamaulipas: Matamoros. Texas: Guadalupe Mts. New Mexico: Mescallero; Capitan Mts.

Canis lupus nubilus Say

1823. *Canis nubilus* Say, *in* Long, Account of an exped. . . . to the Rocky Mts. . . . , 1:169, type from Engineer Cantonment, near present town of Blair, Washington Co., Nebraska.
1829. *Canis lupas* var. *nubilus*, Richardson, Fauna Boreali-Americana, p. 69.
1841. *Canis variabilis* Wied-Neuwied, Reise in das innere Nord-Amerika in . . . 1832–34, 2:95. Type locality, Fort Clark, near Stanton, Mercer Co., North Dakota.

MARGINAL RECORDS (Goldman, 1944:444–445, unless otherwise noted).—Manitoba: Duck Mtn. Minnesota: Crookston. Nebraska: type locality. Oklahoma: Beaver Creek. New Mexico: Gallo Canyon, 40 mi. SE Corona; Carthage; *Mountainair*; 18 mi. N Santa Rosa. Colorado: Fort Garland. Wyoming: Douglas. South Dakota: *Dewey*; Folsom. Montana: Ekalaka; Miles City; upper Missouri River. Saskatchewan: *central Saskatchewan* (Anderson, 1947:56).

Canis lupus occidentalis Richardson

1829. *Canis lupus occidentalis* Richardson, Fauna Boreali-Americana, 1:60. Type locality, by restriction (Miller,

Smiths. Miscl. Coll., 59(15):4, June 8, 1912), Fort Simpson, near mouth of Liard River, Mackenzie.
1829. [*Canis lupus occidentalis*] var. C, *Lupus sticte* Richardson, *loc. cit.*, p. 68. Type locality, banks of Mackenzie River. Applied to a color phase of *C. l. occidentalis*.
1829. [*Canis lupus occidentalis*] var. E, *Lupus ater* Richardson, *op. cit.*, p. 70. Type locality, banks of Mackenzie and Saskatchewan rivers. Applied to a color phase of *C. l. occidentalis*.

MARGINAL RECORDS (Goldman, 1944:427, unless otherwise noted).—Mackenzie: Aylmer Lake; Fort Resolution. Alberta: Edmonton (Cowan, 1947:141). British Columbia: Yellowhead Pass Area (Cowan, 1947:143); Fort McLeod, Cariboo District. Yukon: Pelly Lakes; N. fork Macmillan River. Mackenzie: Fort Rae.

Canis lupus orion Pocock

1935. *Canis lupus orion* Pocock, Proc. Zool. Soc. London, p. 683, September 12, type from Cape York, on Baffin Bay, northwestern Greenland. Known only from the type locality.

Canis lupus pambasileus Elliot

1905. *Canis pambasileus* Elliot, Proc. Biol. Soc. Washington, 18:79, February 21, type from Susitna River, region of Mt. McKinley, Alaska.
1937. *Canis lupus pambasileus*, Goldman, Jour. Mamm., 18:45, February 11.

MARGINAL RECORDS (Goldman, 1944:422, unless otherwise noted).—Alaska: head Salmon Fork, Black River, 120 mi. NW Fort Yukon. Yukon: 6 mi. N New Rampart House; Hoole Canyon, Pelly River; White River. Alaska: Kenai Peninsula, probably near base; *delta of Katmai River* (Schiller and Rausch, 1956:194); St. Lawrence Island (Rausch, 1953:19, as *Canis lupus*).

Canis lupus tundrarum Miller

1912. *Canis tundrarum* Miller, Smiths. Miscl. Coll., 59(15): 1, June 8, type from Point Barrow, Alaska.
1935. *Canis lupus tundrarum*, Pocock, Proc. Zool. Soc. London, p. 681, September 12.

MARGINAL RECORDS.—Alaska: Meade River, near Point Barrow (Goldman, 1944:418). Yukon: Porcupine River (Rand, 1945b:37). Alaska: John River Valley (Rausch, 1950:465); near head Noatak River (Goldman, 1944:418).

Canis lupus youngi Goldman

1937. *Canis lupus youngi* Goldman, Jour. Mamm., 18:40, February 11, type from Harts Draw, N slope Blue Mts., 20 mi. NW Monticello, San Juan Co., Utah.

MARGINAL RECORDS (Goldman, 1944:462–463, unless otherwise noted).—Wyoming: Dry Lake, 15 mi. N Rawlins; Federal. Colorado: 20 mi. NE Pueblo. New Mexico: Tusas; Haynes; Lamy; San Mateo Mts. California: Old Barnett Mine, 12 mi. E Lanfair, Providence Mts. (Johnson, *et al.*, 1948:350). Nevada: Gold Creek (Hall, 1946:269). Utah: South Eden. Wyoming: Rock Springs.

Canis niger
Red Wolf

Revised by Goldman (Classification of wolves, pt. 2, pp. 389–507, in part, pls. 126–129, 131, 1 fig. in text), *in* The wolves of North America, by Young and Goldman, Amer. Wildlife Inst., Washington, D.C., pp. xx + 636, 131 pls., 15 figs. in text, 1944.

External measurements: 1403–1650; 343–420; 210–254. Condylobasal length of skull, 187.5–233.7. Intermediate in size between *C. latrans* and *C. lupus*. Color tending toward tawny, especially on muzzle, ears, and outer surfaces of limbs; a black phase occurs; differs from *C. latrans* in: size larger; build more robust, pelage somewhat coarser; rhinarium and feet larger; cranium higher; rostrum deeper; zygomata more widely spreading; jugal heavier and more deeply inserted on maxilla; occipital condyles usually extending farther transversely; bullae larger; M1 with posteroexternal cusp more nearly equalling anteroexternal cusp. Differs from *C. lupus* in: smaller size and more slender build; rhinarium and foot pads smaller; general coloration more tawny; molariform teeth with crowns more deeply cleft, cusps more compressed laterally and points and shearing edges more trenchant; P4 with protocone more prominent but sometimes absent; M1 with more prominent cingulum and posteroexternal cusp distinctly smaller compared to anteroexternal cusp.

Canis niger gregoryi Goldman

1937. *Canis rufus gregoryi* Goldman, Jour. Mamm., 18:44, February 11, type from Mack's Bayou, 3 mi. E Tensas River, 18 mi. SW Tallulah, Madison Parish, Louisiana.
1942. *Canis niger gregoryi*, Harper, Jour. Mamm., 23:339, August 14.

MARGINAL RECORDS (Goldman, 1944:485–486).—Indiana: Wabash. Mississippi: Biloxi. Texas: Mt. Belview; Segno; Wakefield. Oklahoma: Nashoba (Garland Creek);

Fewell. Arkansas: Fallsville; Lurton; Mull; *Bergman*; Lead Hill. Missouri: West Plains; Cook's Station; Westover. Illinois: Warsaw.

Canis niger niger (Bartram)

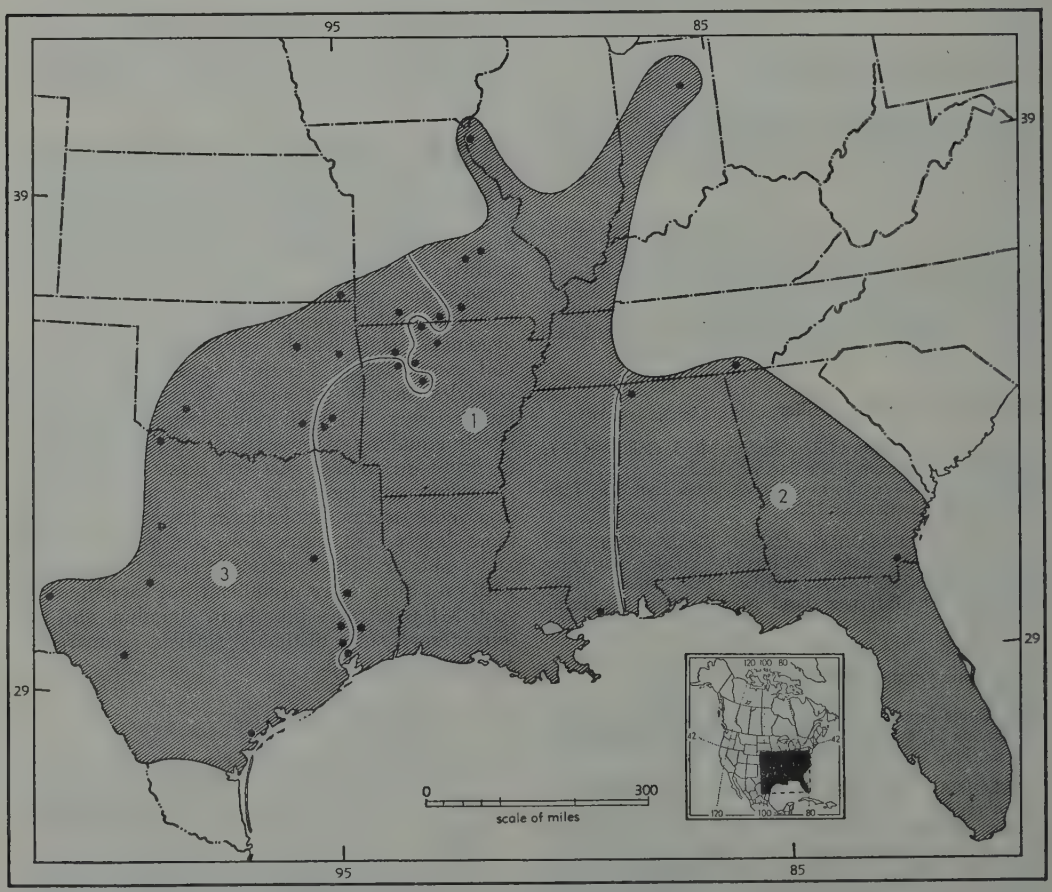
1791. *Lupus niger* Bartram, Travels . . . , p. 199. Type locality, Alachua Savanna (now Payne's Prairie), Alachua Co., Florida.
1942. *Canis niger niger*, Harper, Jour. Mamm., 23:339, August 14.
1912. *Canis floridanus* Miller, Proc. Biol. Soc. Washington, 25:95, May 4, type from Horse Landing, St. Johns River, about 12 mi. S Palatka, Putnam Co., Florida.

MARGINAL RECORDS.—Tennessee: Citico Creek (G. M. Allen, 1942a:232). Georgia: Okefinokee Swamp (Harper, 1927:315), thence around coast of Florida to Alabama: 12 mi. S Cherokee (Goldman, 1944:483).

Canis niger rufus Audubon and Bachman

1851. *Canis lupus* var. *rufus* Audubon and Bachman, The viviparous quadrupeds of North America, 2:240. Type locality, designated by Goldman (Jour. Mamm., 18:45, February 11, 1937), 15 mi. W Austin, Texas.
1942. *Canis niger rufus*, Harper, Jour. Mamm., 23:339, August 14.

MARGINAL RECORDS (Goldman, 1944:488–489, unless otherwise noted).—Kansas: "south of Columbus" (Cockrum, 1952:230). Missouri: Reeds Spring (Hall and Kelson, 1952:340); 3 mi. N Thomasville (Leopold and Hall, 1945: 143); *5 mi. N Gainesville* (*ibid.*). Arkansas: *Raspberry*; Hector; Redstar. Oklahoma: Tahlequah; Atoka. Texas: Tennessee Colony (Eads, 1948:270); Cleveland; 6 mi. N Dayton; Woodsboro (Eads, 1948:270); Nueces River; 22 mi. N Sheffield; 5 mi. SE Doole; 12 mi. NE Cisco; Vernon (Eads, 1948:270). Oklahoma: Wichita Mts. Refuge; Red Fork.



Map 445. *Canis niger:* (1) *C. n. gregoryi*; (2) *C. n. niger*; (3) *C. n. rufus.*

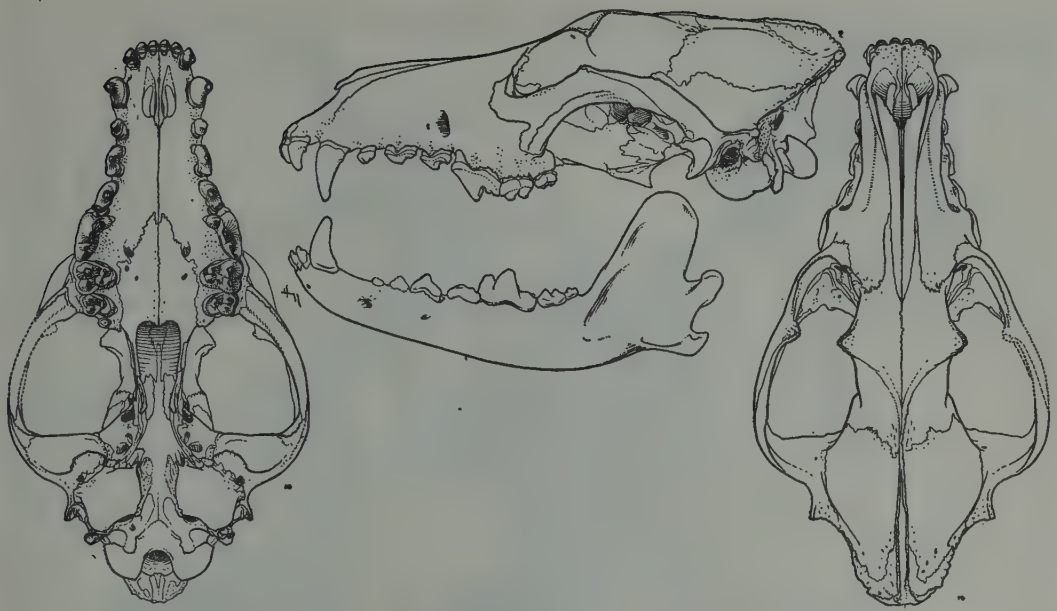


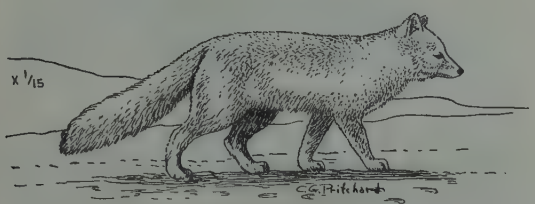
Fig. 467. *Canis niger rufus*, Cremona, Polk Co., Texas, No. 95809 M.V.Z., ♀, X ¾.

Genus Alopex Kaup—Arctic Foxes

1829. *Alopex* Kaup, Skizzerte Entwickelungs-Geschichte und Natürliches System der Europäischen Thierwelt, pt. 1, p. 85. Type, *Canis lagopus* Linnaeus.
1869. *Leucocyon* Gray, Proc. Zool. Soc. London, for 1868, p. 521. Type, *Canis lagopus* Linnaeus.

Resembles *Vulpes* (of which it is regarded as a subgenus by Bobrinski, 1944:146) but differs in: short rounded ears, thickly haired feet, and, usually, seasonal dichromatism, being brownish-gray in summer and white in winter.

Alopex lagopus
Arctic Fox



External measurements of an adult female from Point Barrow, Alaska, are: 1097; 422; 161; (ear from crown) 56.

Characters those of genus. The young ordinarily are born in May after a gestation period of 51–57 days. Food consists of any available animals.

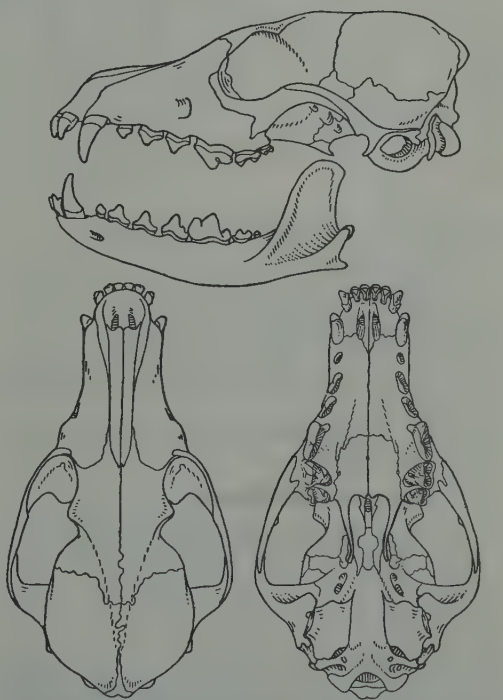
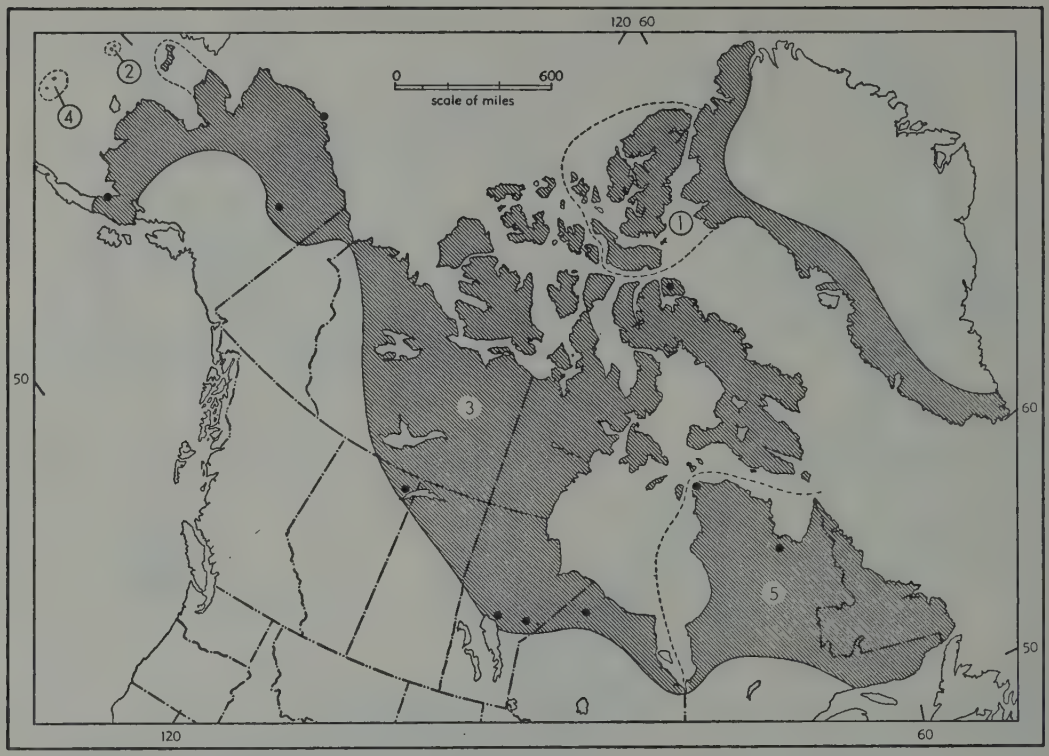


Fig. 468. *Alopex lagopus innuitus*, Point Barrow, Alaska, No. 52366 K.U., ♂, X ¾.



Map 446. *Alopex lagopus:* (1) *A. l. groenlandicus*; (2) *A. l. hallensis*; (3) *A. l. innuitus*; (4) *A. l. pribilofensis*; (5) *A. l. ungava.*

Alopex lagopus groenlandicus (Bechstein)

1799. *Canis groenlandicus* Bechstein, Thomas Pennant's allgemeine Uebersicht der vierfüssigen Theire, 1:270. Type locality, Greenland.

1947. *Alopex lagopus groenlandicus*, Anderson, Bull. Nat. Mus. Canada, 102:50, January 24.

1898. *?Canis lagopus spitzbergenensis* Barrett-Hamilton and Bonhote, Ann. Mag. Nat. Hist., ser. 7, 1:287, April, type from Spitzbergen.

MARGINAL RECORDS (Anderson, 1947:55).—*Ellesmere Island; Greenland.*

Alopex lagopus hallensis (Merriam)

1900. *Vulpes hallensis* Merriam, Proc. Washington Acad. Sci., 2:15, March 14, type from Hall Island, Bering Sea, Alaska. Known also from St. Matthew Island.

1953. *Alopex lagopus hallensis*, Rausch, Murrelet, 34:20, October 5.

Alopex lagopus innuitus (Merriam)

1902. *Vulpes lagopus innuitus* Merriam, Proc. Biol. Soc. Washington, 15:170, August 6, type from Karogar River, Point Barrow, Alaska.

1912. *Alopex lagopus innuitus*, Miller, Bull. U.S. Nat. Mus., 79:82, December 31.

1911. *V[ulpes]. lagopus kenaiensis* Brass, Aus dem Reiche der Pelze, p. 466, April. Type locality, mainland of Alaska. Not *V. kenaiensis* Merriam, 1900.

MARGINAL RECORDS.—Alaska: type locality. Franklin: Bylot Island (R. S. Miller, 1955:169); *Baffin Island* (Anderson, 1947:51). Ontario: Severn River (Preble, 1902: 63). Manitoba: Oxford Lake (*ibid.*); Norway House (*ibid.*). Alberta: Chipewyan (Soper, 1942:131). Alaska: Yukon Flats (Dice, 1921:21); Igagik (Osgood, 1904:40).

Alopex lagopus pribilofensis (Merriam)

1902. *Vulpes pribilofensis* Merriam, Proc. Biol. Soc. Washington, 15:171, August 6, type from St. George Island, Pribilof Islands, Alaska. Known only from type locality and St. Paul Island.

1953. *Alopex lagopus pribilofensis*, Rausch, Murrelet, 34: 20, October 5.

Alopex lagopus ungava (Merriam)

1902. *Vulpes lagopus ungava* Merriam, Proc. Biol. Soc. Washington, 15:170, August 6, type from Fort Chimo, south of Ungava Bay, Quebec.

1912. *Alopex lagopus ungava*, Miller, Bull. U.S. Nat. Mus., 79:82, December 31.

MARGINAL RECORDS (Anderson, 1947:51).—Quebec: Cape Wolstenholme; type locality; *north shore of Gulf of St. Lawrence.*

Genus Vulpes Bowdich—Swift and Red Foxes

1821. *Vulpes* Bowdich, An analysis of the natural classification of Mammalia, p. 40. Type, *Canis vulpes* Linnaeus. (*Vulpes* Oken, 1816, is not available because his names are non-Linnaean.)
1839. *Cynalopex* Hamilton-Smith, The naturalist's library (edit. Jardine), 25:222. Based on *Canis corsac* Linnaeus [= *Vulpes corsac*].

Medium to small canids with long, pointed ears, muzzle elongate and attenuated, tail round and bushy, usually as long as length of head and body; width of rostrum measured at a point opposite cone of P2 usually less than 18 per cent of condylobasal length; teeth relatively widely spaced and relatively narrow.

KEY TO NORTH AMERICAN SPECIES OF VULPES

1. Tail with white tip; feet black. . *V. fulva*, p. 855
1′. Tail with black tip; feet not black.
  2. Ears short, less than 75 from notch; bullae relatively small (see Fig. 471); skull relatively broad; found on the Great Plains. . . . . *V. velox*, p. 860
  2′. Ears long, more than 75 from notch; bullae relatively large (see Fig. 470); skull relatively narrow; found west of the Rocky Mountains. . . . *V. macrotis*, p. 858

Vulpes fulva
Red Fox

External measurements: 900–1025; 350–400; 145–171. Color normally reddish-yellow, feet and dorsal surface of ears black, tail with a white tip; black silver and cross color-phases occur in nature.

Four to 10 young are born in the spring after a gestation period of 51 days. Young emerge from the den when approximately 5 weeks old.

Red foxes are omnivorous, feeding on a variety of animal and plant food.

Whether the red fox of the eastern United States (much or all of the area shown, on the distribution map as the range of *Vulpes fulva fulva*) is a native animal or instead a stock introduced from Europe is unknown at this writing.

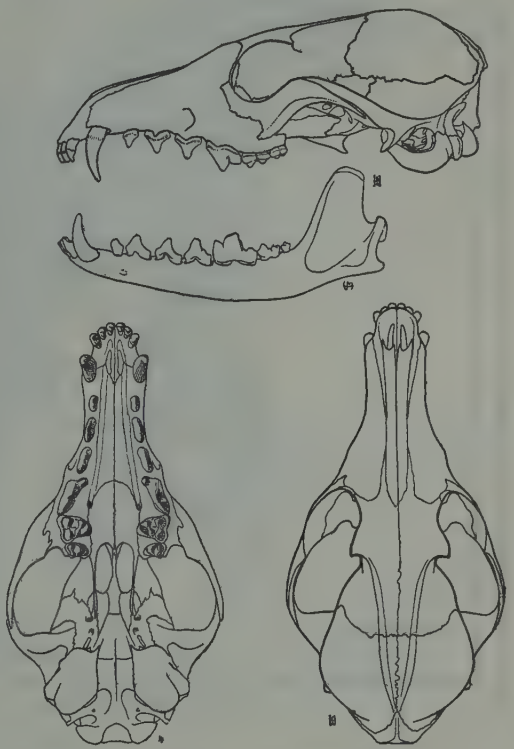
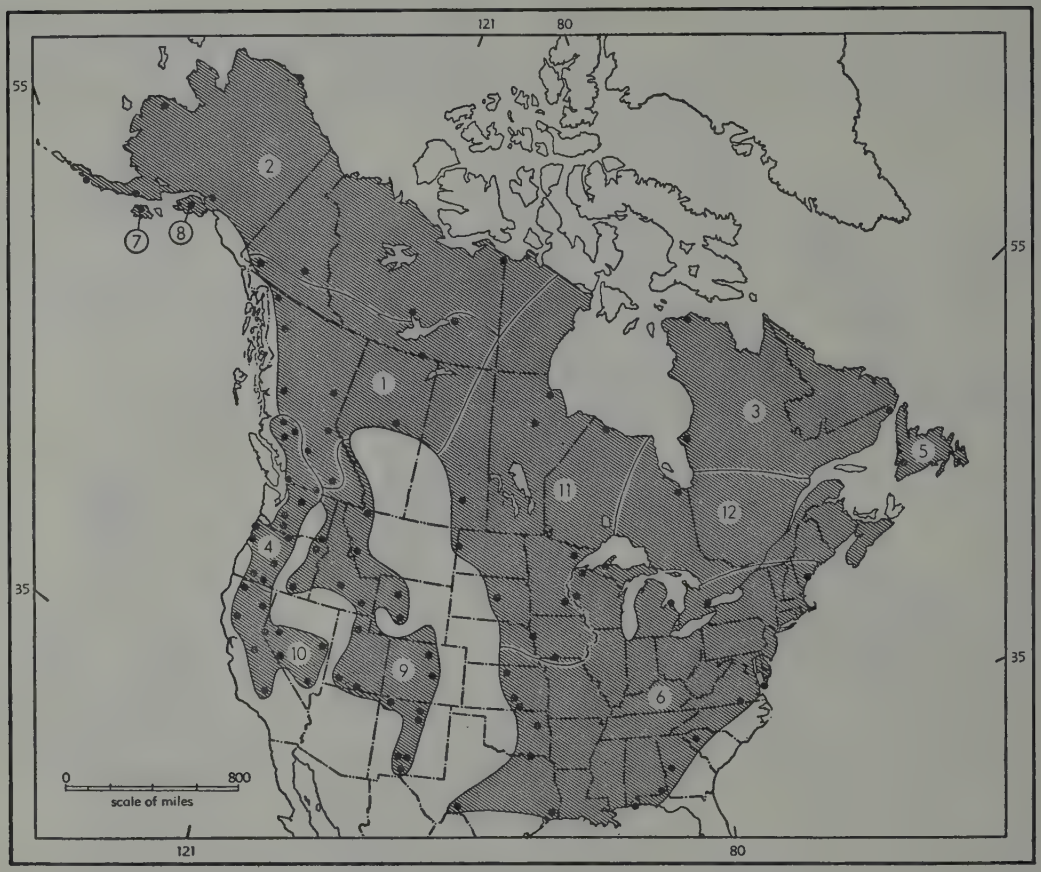


Fig. 469. *Vulpes fulva necator*, Marlette Lake, 8000 ft., Ormsby Co., Nevada, No. 69636 M.V.Z., ♂, X ½.

Vulpes fulva abietorum Merriam

1900. *Vulpes alascensis abietorum* Merriam, Proc. Washington Acad. Sci., 2:669, December 28, type from Stuart Lake, British Columbia.
1936. *Vulpes fulva abietorum*, V. Bailey, Nature Mag., 28(5):317, November.
1911. ? V[*ulpes*]. *argenteus sitkaensis* Brass, Aus dem Reiche der Pelze, p. 448, April. Type locality, West Coast, especially the Aleutian Islands.

MARGINAL RECORDS.—Mackenzie: Fort Reliance, Great Slave Lake (J. A. Allen, 1910:11); mouth Salt River (*ibid.*). Alberta: 20 mi. S Athabaska Landing (*ibid.*). British Columbia: Little Prairie (Cowan and Guiguet, 1956:288); Isaacs Lake (Hall, 1934:368); Akolkolex River (39035 KU); Lac La Hache (39034 KU); Quick (Cowan and Guiguet, 1956:288); Telegraph Creek (*ibid.*); Atlin



Map 447. *Vulpes fulva.*

1. *V. f. abeitorum*
2. *V. f. alascensis*
3. *V. f. bangsi*
4. *V. f. cascadensis*
5. *V. f. deletrix*
6. *V. f. fulva*
7. *V. f. harrimani*
8. *V. f. kenaiensis*
9. *V. f. macroura*
10. *V. f. necator*
11. *V. f. regalis*
12. *V. f. rubricosa*

(*ibid.*). Yukon: 6 mi. SW Kluane, 2559 ft. (Baker, 1951: 113).

Vulpes fulva alascensis Merriam

1900. *Vulpes alascensis* Merriam, Proc. Washington Acad. Sci., 2:668, December 28, type from Andreafski, about 70 mi. above delta of Yukon River, Alaska.
1929. *Vulpes fulva alascensis,* Hall, Univ. California Publ. Zool., 30:421, March 19.

MARGINAL RECORDS.—Alaska: Barrow (Hall, 1929: 421). Mackenzie: Perry River District, Queen Maud Sea (Gavin, 1945:228); Great Slave Lake (Anderson, 1947: 48). Yukon: Ross River (mile 90), Canol Road (Rand, 1945a:33). Alaska: Knik Valley (Wilber, 1946:215); Cold Bay (Osgood, 1904:40); Alaska Peninsula, opposite Popof Island (J. A. Allen, 1902:225); type locality.

Vulpes fulva bangsi Merriam

1900. *Vulpes rubricosa bangsi* Merriam, Proc. Washington Acad. Sci., 2:667, December 28, type from L'Anse au Loup, Strait of Belle Isle, Labrador.
1936. *Vulpes fulva bangsi,* V. Bailey, Nature Mag., 28(5): 317, November.

MARGINAL RECORDS (Anderson, 1947:48).—Quebec: Hudson Strait; type locality; north end James Bay.

Vulpes fulva cascadensis Merriam

1900. *Vulpes cascadensis* Merriam, Proc. Washington Acad. Sci., 2:665, December 28, type from Trout Lake, south base Mt. Adams, Skamania Co., Washington.
1936. *Vulpes fulva cascadensis,* V. Bailey, Nature Mag., 28(5):317, November.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:286); Anahim Lake; Chezacut; Baldy Mtn., near Bridesville. Washington: Loomis (Taylor and Shaw, 1929:13). Oregon (V. Bailey, 1936:282): The Dalles; 40 mi. S Bend; *Yamsay Mtn.*; Swan Lake Valley; Mt. McLoughlin; Mt. Hebo; Tillamook. Washington: type locality; Mt. Rainier National Park (Dalquest, 1948:225). British Columbia (Cowan and Guiguet, 1956:286): Boundary Bay; Homathko River.

Vulpes fulva deletrix Bangs

1898. *Vulpes deletrix* Bangs, Proc. Biol. Soc. Washington, 12:36, March 24, type from Bay St. George, Newfoundland. Restricted to Newfoundland.
1936. *Vulpes fulva deletrix*, V. Bailey, Nature Mag., 28(5): 317, November.

Vulpes fulva fulva (Desmarest)

1820. *Canis fulvus* Desmarest, Mammalogie . . . , pt. 1, p. 203, *in* Encyclopédie méthodique. . . . Type locality, Virginia.
1842. *Vulpes fulvus*, De Kay, The zoology of New York, Mammalia, p. 44.
1894. *Vulpus* [*sic*] *pennsylvanicus* [*sic*] Rhoads, Amer. Nat., 28:524, June. Not [*Vulpes*] *Pensylvanicus* Boddaert, 1784 [= *Urocyon cinereoargenteus* (Schreber), 1775].

MARGINAL RECORDS.—Michigan (Burt, 1946:156): Houghton County; Huron County. Ontario: King Twp., York Co. (Snyder and Logier, 1930:177). Maine: islands of Casco Bay (Norton, 1930:36). Virginia: Northampton County (Handley and Patton, 1947:138); Brunswick County (*ibid.*). South Carolina: "western South Carolina" (Penney, 1950:85). Georgia: 1½ mi. E Geneva (14608 KU). Alabama (Howell, 1921:32): Dothan; Orange Beach. Texas (introduced): Sour Lake (V. Bailey, 1905:178); along Howard Creek and Pecos River (*ibid.*). Oklahoma: Red River Valley (Blair, 1939:107); 12 mi. N Tahlequah (*ibid.*). Kansas (Cockrum, 1952:233): Cowley County; near Halstead; Waconda Springs. Nebraska: *"rare southeastwardly"* (Swenk, 1915:853). Wisconsin: Dunn County (Cory, 1912:311); Bayfield County (*ibid.*). Concerning the status of this subspecies see the account of the species.

Vulpes fulva harrimani Merriam

1900. *Vulpes harrimani* Merriam, Proc. Washington Acad. Sci., 2:14, March 14, type from Kodiak Island, Alaska. Known only from Kodiak Island.
1936. *Vulpes fulva harrimani*, V. Bailey, Nature Mag., 28(5):317, November.

Vulpes fulva kenaiensis Merriam

1900. *Vulpes kenaiensis* Merriam, Proc. Washington Acad. Sci., 2:670, December 28, type from Kenai Peninsula, Alaska. Known only from Kenai Peninsula.
1936. *Vulpes fulva kenaiensis*, V. Bailey, Nature Mag., 28(5):317, November.

Vulpes fulva macroura Baird

1852. *Vulpes macrourus* Baird, *in* Stansbury, Exploration and survey of the Valley of the Great Salt Lake of Utah . . . , (Spec. Sess., U. S. Senate, Exec. No. 3), App. C, p. 309, June, type from Wasatch Mts., bordering Great Salt Lake, Utah.
1936. *Vulpes fulva macroura*, V. Bailey, Nature Mag., 28(5):317, November.

MARGINAL RECORDS.—*Canada: Rocky Mts.* (Rand, 1948b:105). Montana: Swiftcurrent Creek (Bailey, 1918: 85); "mountains around head of the Bitterroot (Henshaw and Birdseye, 1911:21). Wyoming: 3¼ mi. S and 27 mi. W Cody (39450 KU); 17 mi. S and 6½ mi. W Lander, 8450 ft. (37360 KU). Colorado: Ward (Cary, 1911:175); Garden of the Gods (Warren, 1942:88). New Mexico: west slope Wheeler Peak, 12,400 ft. (V. Bailey, 1931:297); Pecos Baldy (V. Bailey, 1931:296); Point of Sands, Tularosa Basin (Halloran, 1946:158); Organ Mts. (*ibid.*); Ash Canyon, San Andres Mts. (*ibid.*); Farmington (V. Bailey, 1931:297); *Shiprock* (*ibid.*). Utah: north side Navajo Mtn. (Durrant, 1952:401); 15 mi. S Henrieville (*ibid.*); type locality. Idaho (Davis, 1939:145): near Pocatello; Sawtooth Mts. Oregon: Steens Mtn. (V. Bailey, 1936:285); about Elgin (V. Bailey, 1936:284). Washington (Dalquest, 1948:415): Blue Mts.; *northeast Washington.*

Vulpes fulva necator Merriam

1900. *Vulpes necator* Merriam, Proc. Washington Acad. Sci., 2:664, December 28, type from Whitney Meadow, near Mt. Whitney, Tulare Co., California.
1930. *Vulpes fulva necator*, Grinnell, Dixon, and Linsdale, Univ. California Publ. Zool., 35:469, October 10.

MARGINAL RECORDS (Grinnell, *et al.*, 1937:381, unless otherwise noted).—California: West side Mt. Shasta; *Mt. Shasta, 7000 ft.*; near Eagle Lake. Nevada (Hall, 1946: 233): Marlette Lake, 8000 ft.; Fairview; Shell Creek Range; 1 mi. W Hidden Forest, 9000 ft.; Silver Peak Range. California: *south side Cirque Peak*; summit Piute Mts.; *Alwell's Mill, E. Fork Kaweah River* (Merriam, 1900:664); Buck Meadows; 7 mi. NE Maxwell (Grinnell, *et al.*, 1937: 383, systematic status uncertain).

Vulpes fulva regalis Merriam

1900. *Vulpes regalis* Merriam, Proc. Washington Acad. Sci., 2:672, December 28, type from Elk River, Sherburne Co., Minnesota.
1929. *Vulpes fulva regalis*, B. Bailey, Jour. Mamm., 10:157, May 9.

MARGINAL RECORDS.—Manitoba: Churchill (Preble, 1902:62). Ontario: Severn (Cross, 1941:35). Minnesota (Swanson, *et al.*, 1945:69–70): Lake County; Dakota County. Iowa (Scott, 1937:64): Leon; Missouri Valley. South Dakota: Hyde County (Over and Churchill, 1945: 18–19). North Dakota: Fort Union (V. Bailey, 1927:161). Saskatchewan: Touchwood Hills (Hall, 1938:108). Manitoba: Split Lake (Preble, 1902:62).

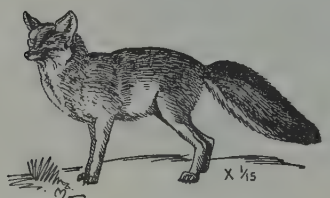
Vulpes fulva rubricosa Bangs

1897. *Vulpes pennsylvanica vafra* Bangs, Proc. Biol. Soc. Washington, 11:53, March 16, type from Digby, Nova Scotia. Not *Vulpes vafer* Leidy, 1869, a fossil species.

1898. *Vulpes pennsylvania rubricosa* Bangs, Science, n. s., 7:272, February 25, a renaming of *V. p. vafra* Bangs.
1936. *Vulpes fulva rubricosa*, C. Sheldon, Jour. Mamm., 17:211, August 17.

MARGINAL RECORDS (Anderson, 1947:49, unless otherwise noted).—Ontario: Moose Factory (Cross, 1941: 35). *Prince Edward Island. Cape Breton Island. Nova Scotia. New Brunswick. Northern Ontario west to Lake Superior.*

Vulpes macrotis
Kit Fox



External measurements: 600–800; 225–300; 111–132. Color buffy yellow, tail black-tipped, feet no darker than rest of body.

The kit fox is a desert dweller. A den commonly has 3 entrances. Rabbits, rodents, and insects are eaten. There are 4 to 7 young.

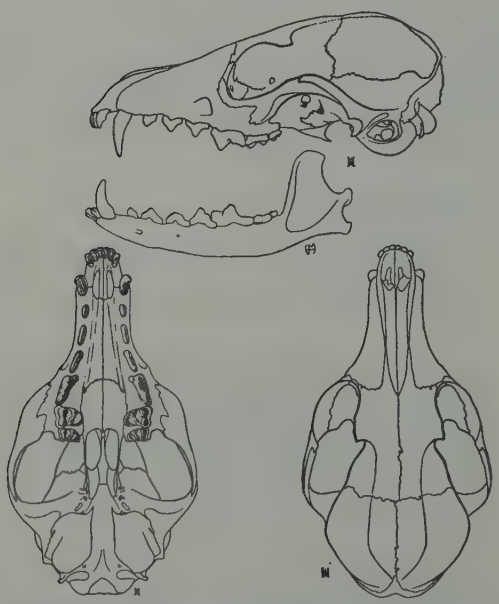


Fig. 470. *Vulpes macrotis nevadensis*, 5 mi. NE Hazen, 4000 ft., Nevada, No. 90014 M.V.Z., ♂, X ¾.

Vulpes macrotis arsipus Elliot

1904. *Vulpes arsipus* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):256, January 7, type from Daggett, San Bernardino Co., California.
1913. *Vulpes macrotis arsipus*, Grinnell, Proc. California Acad. Sci., ser. 4, 3:287, August 28.
1931. *Vulpes macrotis arizonensis* Goldman, Jour. Washington Acad. Sci., 21:249, June 4, type from 2 mi. S Tule Tanks, Yuma Co., Arizona.

MARGINAL RECORDS.—Nevada: 4 mi. N Mesquite (Hall, 1946:239). Arizona: Fort Mohave (Benson, 1938: 18); Vicksburg (*ibid.*); near Maricopa (J. A. Allen, 1895: 255); Tucson (*ibid.*). Sonora: near Punta Peñasca (Benson, 1938:18). California: Brawley (Grinnell, *et al.*, 1937: 406); Palm Springs (*ibid.*); Victorville (Benson, 1938:18); Lovejoy Buttes, near Lancaster (*ibid.*); Borax Flat (Grinnell, *et al.*, 1937:406); Triangle Spring, Death Valley (Benson, 1938:18). Nevada: *Indian Springs* (Hall, 1946:239).

Vulpes macrotis devia Nelson and Goldman

1909. *Vulpes macrotis devius* Nelson and Goldman, Proc. Biol. Soc. Washington, 22:25, March 10, type from Llano de Yrais, opposite Magdalena Island, Baja California. Known only from type locality.

Vulpes macrotis macrotis Merriam

1888. *Vulpes macrotis* Merriam, Proc. Biol. Soc. Washington, 4:136, February 18, type from Riverside, Riverside Co., California.

MARGINAL RECORDS.—California: type locality; Morino, San Jacinto Plain (G. M. Allen, 1942a:197).

Vulpes macrotis mutica Merriam

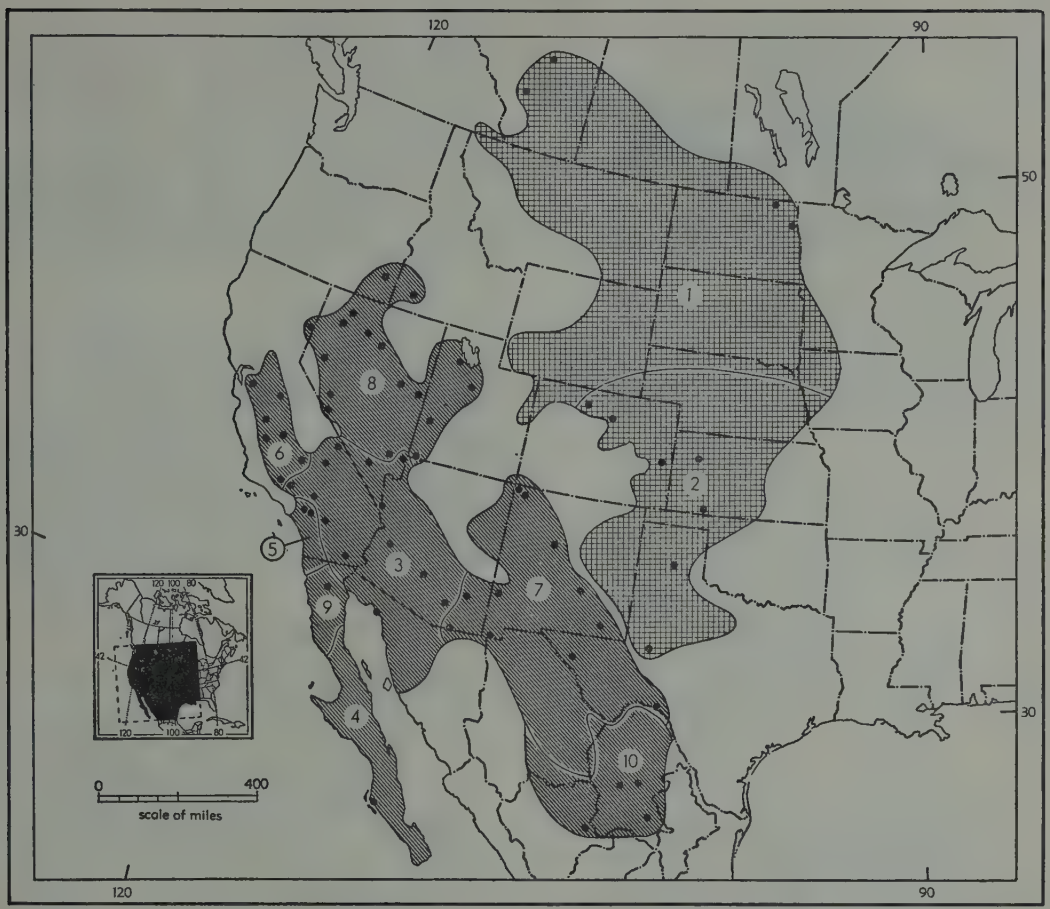
1902. *Vulpes muticus* Merriam, Proc. Biol. Soc. Washington, 15:74, March 22, type from Tracy, San Joaquin Co., California.
1913. *Vulpes macrotis muticus*, Grinnell, Proc. California Acad. Sci., ser. 4, 3:287, August 28.

MARGINAL RECORDS (Grinnell, *et al.*, 1937:403–404, unless otherwise noted).—California: Tracy; vicinity of Lagrange; Goshen; Walker Basin (Benson, 1938:22); 1 mi. E Rose Station, 1200 ft.; Coalingua; 6 mi. E Panoche (Hawbecker, 1943:499).

Vulpes macrotis neomexicana Merriam

1902. *Vulpes macrotis neomexicanus* Merriam, Proc. Biol. Soc. Washington, 15:74, March 22, type from Baird's Ranch, eastern side San Andres Mts., Dona Ana Co., New Mexico.

MARGINAL RECORDS (V. Bailey, 1931:298–300, unless otherwise noted).—New Mexico: San Juan Valley near Shiprock; San Juan Valley near Fruitland; Albuquerque; Loveless Lake, 10 mi. N Capitan Mts.; Carlsbad. Texas: mouth of Pecos (V. Bailey, 1905:179); near Sierra Blanca (Davis and Robertson, 1944:264). New Mexico: south end Animas Valley. Arizona: Fort Huachuca (Cahalane, 1939: 438); Fort Grant. New Mexico: Cliff.



Map 448. *Vulpes velox* and *Vulpes macrotis*.

Guide to kinds			
1. *V. v. hebes*	2. *V. v. velox*	5. *V. m. macrotis*	8. *V. m. nevadensis*
	3. *V. m. arsipus*	6. *V. m. mutica*	9. *V. m. tenuirostris*
	4. *V. m. devia*	7. *V. m. neomexicana*	10. *V. m. zinseri*

Vulpes macrotis nevadensis Goldman

1931. *Vulpes macrotis nevadensis* Goldman, Jour. Washington Acad. Sci., 21:250, June 4, type from near Willow Creek Ranch, near Jungo, Humboldt Co., Nevada.

MARGINAL RECORDS (Hall, 1946:238–239, unless otherwise noted).—Oregon: Owyhee Valley between Rome and Pollock (V. Bailey, 1936:285). Idaho: 20 mi. S Grandview (Davis, 1939:145). Nevada: Adelaide; 35 mi. SW Argenta; White Sage Valley; Spring Valley near Osceola. Utah (Durrant, 1952:403, unless otherwise noted): 15 mi. N Knolls; 2 mi. S Topliff; 30 mi. W Milford, 6500 ft.; near St. George (Hardy, 1945:85). Nevada: 1 mi. N Rox; *Coyote Spring; 2½ mi. N Oasis, 5300 ft.*; Smith Ranch; 5 mi. SE Sodaville; *17 mi. S Fallon, 4100 ft.*; 5 mi. NE Hazen, 4000 ft. California: near Calneva (Grinnell, *et al.*, 1937: 406). Nevada: Sulphur; type locality.

Vulpes macrotis tenuirostris Nelson and Goldman

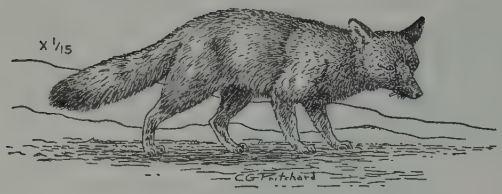
1931. *Vulpes macrotis tenuirostris* Nelson and Goldman, Jour. Mamm., 12:302, August 24, type from Trinidad Valley, northwest base of Sierra San Pedro Mártir, Baja California. Known only from the type locality.

Vulpes macrotis zinseri Benson

1938. *Vulpes macrotis zinseri* Benson, Proc. Biol. Soc. Washington, 51:21, February 18, type from San Antonio de Jaral, Coahuila.

MARGINAL RECORDS (Baker, 1956:296).—Coahuila: 16 mi. E and 3 mi. S Cuatro Ciénegas; type locality. Durango: *2 mi. SSE Chocolate*; 11 mi. W and 8 mi. S Lerdo. Coahuila: 22 mi. W and 4 mi. S Cuatro Ciénegas.

Vulpes velox
Swift Fox



This fox may be only subspecifically distinct from *V. macrotis*. *V. velox* differs from *V. macrotis* in shorter ears, broader skull and slightly larger size. According to reports the construction of the den and the nature of the food are essentially as in *Vulpes macrotis*.

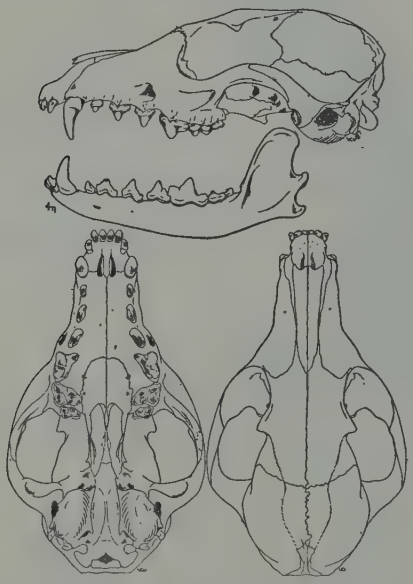


Fig. 471. *Vulpes velox velox*, First View, Cheyenne Co., Colorado, No. 1601 K.U., ♂, X ¾.

Vulpes velox hebes Merriam

1902. *Vulpes velox hebes* Merriam, Proc. Biol. Soc. Washington, 15:73, March 22, type from Calgary, Alberta.

MARGINAL RECORDS.—*Southwestern Saskatchewan* (Anderson, 1947:49). North Dakota: Pembina Mts. (Swanson, *et al.*, 1945:71); Souris River (V. Bailey, 1927:164). *Western Iowa* (G. M. Allen, 1942a:195). *Wyoming* (Anderson, 1947:49). Montana: *along eastern edge of Glacier National Park* (G. M. Allen, 1942a:195). *Southeastern British Columbia* (Anderson, 1947:49). Alberta: Buffalo Lake (G. M. Allen, 1942a:196); type locality.

Vulpes velox velox (Say)

1823. *Canis velox* Say, *in* Long, Account of an exped. . . . to the Rocky Mts. . . . , 1:487, type from South Platte River (in Logan Co. ?), Colorado.

1851. *Vulpes velox*, Audubon and Bachman, The viviparous quadrupeds of North America, 2:13.

MARGINAL RECORDS.—Colorado: near Arapahoe Creek, North Park (Cary, 1911:176); *type locality*. Kansas (Cockrum, 1952:235): Monument; south of State Park, Meade Co. Texas (V. Bailey, 1905:179): Washburn; Midland. Colorado: First View (1601 KU); 3 mi. NE Boulder (Cary, 1911:176).

Genus **Urocyon** Baird—Gray Foxes

1858. *Urocyon* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):121, July 14. Type, *Canis virginianus* Erxleben [= *Canis cinereoargenteus* Schreber].

Median dorsal line of stiff black hair on tail; temporal ridges of skull widely separated but so approaching each other posteriorly as to form a lyrate- or U-shaped figure; ventral border of ramus of lower jaw having a distinct "step" midway between tip of angular process and anterior border of coronoid process.

Key to Species of Urocyon

1. Total length less than 800, tail less than 300, condylobasal length less than 106; found only on certain islands off the coast of southern California. . . . . *U. littoralis*, p. 864
1′. Total length more than 800, tail more than 300, condylobasal length more than 106; not found on islands off the coast of southern California. . . . . *U. cinereoargenteus*, p. 860

Urocyon cinereoargenteus
Gray Fox

External measurements: 800–1125; 275–443; 100–150. Condylobasal length of skull, 110–130. Throat white, face gray, sides of neck, lower flanks, and underparts of tail rusty, tail with median dorsal streak of black hair. Ventral border of mandible with a distinct "step."

Two to 7 young are born in spring after a gestation period of approximately 63 days.

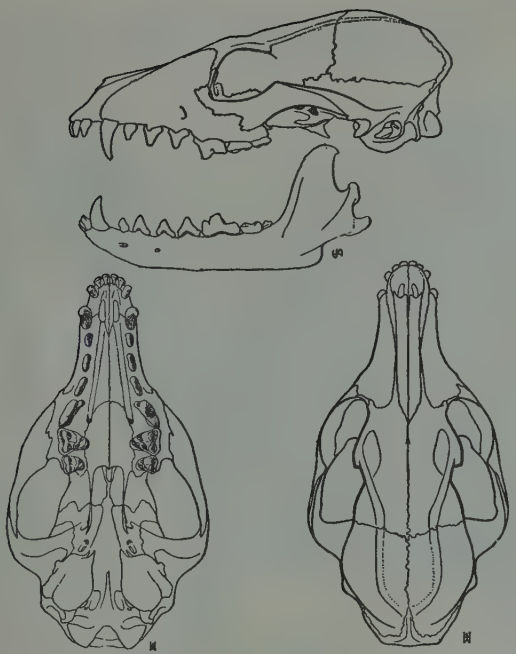


Fig. 472. *Urocyon cinereoargenteus scottii*, Colorado River, 2 mi. N California–Nevada Monument, Nevada, No. 61465 M.V.Z., ♂, X ½.

Urocyon cinereoargenteus borealis Merriam

1903. *Urocyon cinereoargenteus borealis* Merriam, Proc. Biol. Soc. Washington, 16:74, May 29, type from Marlboro, 7 mi. from Monadnock, Cheshire Co., New Hampshire.

MARGINAL RECORDS.—Quebec: Compton County (Anderson, 1947:50). Maine: Pennellville (Palmer, 1956: 62). New Hampshire: near Exeter (*op. cit.*:65); type locality. Massachusetts: Easthampton (Crane, 1931:269). Vermont (Osgood, 1938:437): *Springfield; Rutland*; Whiting. Ontario (Anderson, 1947:50): 6 mi. E Kaladar; near Glengarry County.

Urocyon cinereoargenteus californicus Mearns

1897. *Urocyon cinereoargenteus californicus* Mearns, Preliminary diagnoses of new mammals of the genera *Lynx*, *Urocyon*, *Spilogale* and *Mephitis*, from the Mexican boundary line, p. 3, January 12 (preprint of Proc. U.S. Nat. Mus., 20:459, December 24, 1897), type from Tahquitz Valley, San Jacinto Mts., Riverside Co., California.

MARGINAL RECORDS (Grinnell, *et al.*, 1937:432, unless otherwise noted).—California: Rip Rap Mine, Piute Mts.; Cactus Flat; *Whitewater*; Santa Rosa Mtn. Baja California (Huey, 1928:207): Laguna Hanson; Rancho San Pablo, 10 mi. SE Alamo. California: Mt. Piños.

Urocyon cinereoargenteus cinereoargenteus (Schreber)

1775. *Canis cinereo argenteus* Schreber, Die Säugthiere . . . , Theil 2, Heft 13, pl. 92. Type locality, eastern North America.
1894. *Urocyon cinereo-argenteus*, Rhoads, Amer. Nat., 28: 524, June.
1775. *Urocyon virginianus virginianus* Schreber, Die Säugthiere . . . , Theil 3, p. 585 (vernacular name and description on p. 361), pl. 92B. Type locality, "Carolina und die wärmer Gegenden von Nordamerica. . . ." Based primarily on the gray fox of Catesby.
1784. [*Vulpes*] *Pensylvanicus* Boddaert, Elench. Aním., p. 97, based on the "Brant fox" from Pennsylvania of Pennant (History of quadrupeds, 1781, p. 235).

MARGINAL RECORDS.—Michigan (Burt, 1946:158): Cheboygan County. Ontario: Oxford County (Anderson, 1947:50). New York (Schoonmaker, 1929:150): Canajoharie; Nassau. South Carolina: upper South Carolina (Penney, 1950:85). Tennessee (Kellogg, 1939:265): Walden Ridge near Soddy; Big Sandy. Illinois (Necker and Hatfield, 1941:48): Union County; near Petersburg; Deerfield.

Urocyon cinereoargenteus nigrirostris (Lichtenstein)

1850. *Canis nigrirostris* Lichtenstein, Abhand. d. konig. Akad. d. Wiss., Berlin, for 1827, p. 106, type from Real Arriba [= Temascaltepec], Estado México.
1938. *Urocyon cinereoargenteus colimensis* Goldman, Jour. Washington Acad. Sci., 28:495, November 15, type from 3 mi. W Colima, Colima.

MARGINAL RECORDS (Goldman, 1938d:496–497, unless otherwise noted).—Sinaloa: Sierra de Choix. Durango: Chacala. San Luis Potosí: Presa de Guadalupe (Dalquest, 1953b:177). Hidalgo: El Chico. Puebla: Piaxtla. Oaxaca: Juquila. Nayarit: Acaponeta.

Urocyon cinereoargenteus costaricensis Goodwin

1938. *Urocyon cinereoargenteus costaricensis* Goodwin, Amer. Mus. Novit., 987:2, May 13, type from Sabanilla de Pirris, Province of San José, Costa Rica.

MARGINAL RECORDS.—Costa Rica: *Escazú* (Goodwin, 1946:438); *Pozo Azul* (Hall and Kelson, 1952:338); type locality.

Urocyon cinereoargenteus floridanus Rhoads

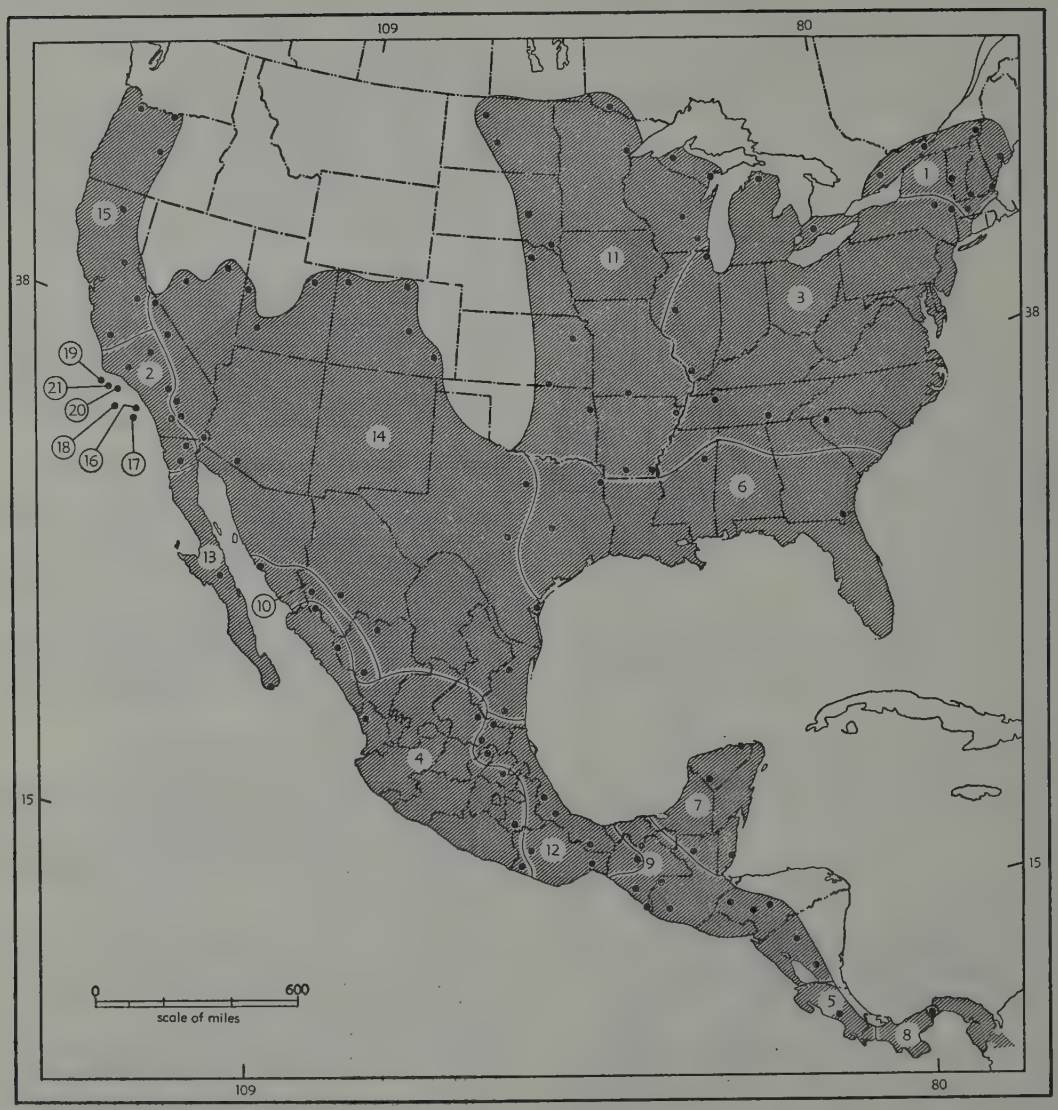
1895. *Urocyon cinereo-argenteus floridanus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 47:42, April 9, type from Tarpon Springs, Hillsboro Co., Florida.

MARGINAL RECORDS.—Mississippi: Mississippi State College (Yeager, 1938:376). Georgia: Okefinokee Swamp (Harper, 1927:313), thence through peninsular Florida and westward along Gulf Coast to Texas: Brazos County (Peterson, 1946:166); Harrison County (Beuchner, 1944:185).

Urocyon cinereoargenteus fraterculus Elliot

1896. *Urocyon cinereo-argentatus* [*sic*] *fraterculus* Elliot, Field Columb. Mus., Publ. 11, Zool. Ser., 1(3):80, June 11, type from San Felipe, Yucatán.
1899. *Urocyon parvidens* Miller, Proc. Acad. Nat. Sci. Philadelphia, 51:276, July 26, type from Mérida, Yucatán.

MARGINAL RECORDS.—Yucatán: type locality, thence down east coast to British Honduras: Stann Creek Valley



Map 449. *Urocyon cinereoargenteus* and *Urocyon littoralis*.

1. *U. c. borealis*
2. *U. c. californicus*
3. *U. c. cinereoargenteus*
4. *U. c. nigrirostris*
5. *U. c. costaricensis*
6. *U. c. floridanus*
7. *U. c. fraterculus*
8. *U. c. furvus*
9. *U. c. guatemalae*
10. *U. c. madrensis*
11. *U. c. ocythous*
12. *U. c. orinomus*
13. *U. c. peninsularis*
14. *U. c. scottii*
15. *U. c. townsendi*
16. *U. littoralis catalinae*
17. *U. littoralis clementae*
18. *U. littoralis dickeyi*
19. *U. littoralis littoralis*
20. *U. littoralis santacruzae*
21. *U. littoralis santarosae*

(Hershkovitz, 1951:563). Guatemala: 1–8 mi. S La Libertad (Goodwin, 1955d:5). Yucatán: San Anselmo (Gaumer, 1917:200).

Urocyon cinereoargenteus furvus G. M. Allen and Barbour

1923. *Urocyon cinereoargenteus furvus* G. M. Allen and Barbour, Bull. Mus. Comp. Zool., 65:266, February, type from 3 mi. W Balboa, Canal Zone. Known only from the type locality.

Urocyon cinereoargenteus guatemalae Miller

1899. *Urocyon guatemalae* Miller, Proc. Acad. Nat. Sci. Philadelphia, 51:278, July 26, type from Nentón, Huehuetenango, Guatemala.
1938. *Urocyon cinereoargenteus guatemalae*, Goldman, Jour. Washington Acad. Sci., 28(11):495, November 15.

MARGINAL RECORDS (Goodwin, 1942:183, unless otherwise noted).—Chiapas: Tumbalá (Villa, 1949:505). Guatemala: type locality. Honduras: Belén Guacho; *Las Flores*; La Flor Archaga. Nicaragua (J. A. Allen, 1910: 107): Matagalpa; San Rafael. Honduras: *Tegucigalpa*; La Cruz Grande. Guatemala: Volcán San Lucas (Goodwin, 1934:22). Chiapas (Hooper, 1947:44): vicinity of Suchiate; Prusia, 1200 m.

Urocyon cinereoargenteus madrensis Burt and Hooper

1941. *Urocyon cinereoargenteus madrensis* Burt and Hooper, Occas. Papers Mus. Zool., Univ. Michigan, 430:4, May 27, type from Carimechi, Río Mayo, Chihuahua.

MARGINAL RECORDS.—Sonora: Guaymas (Booth, 1957:16). Chihuahua: type locality. Durango: La Laguna (Hooper, 1955:8).

Urocyon cinereoargenteus ocythous Bangs

1899. *Urocyon cinereoargenteus ocythous* Bangs, Proc. New England Zool. Club, 1:43, June 5, type from Platteville, Grant Co., Wisconsin.

MARGINAL RECORDS.—Ontario: Wild Potato Lake, Rainy River District (Anderson, 1947:50). Minnesota: St. Louis County (Swanson, *et al.*, 1945:70). Michigan (Burt, 1946:158, recorded as *U. c. cinereoargenteus*): *Gogebic County*; Ontonagan County; Delta County. Wisconsin (Cory, 1912:305): Adams County; Delavan. Missouri: 5 mi. N Gainesville (Leopold and Hall, 1945:143). Arkansas (Sealander, 1956:281): Mississippi County; Chicot County; El Dorado. Oklahoma: Adair County (Blair, 1939:107). Kansas (Cockrum, 1952:237): 5 mi. W and 3 mi. S Arkansas City; 8 mi. E Topeka. Nebraska: Pierce County (Swenk, 1908:123). South Dakota (Findley, 1956a:1): near Vermillion; Wessington Springs. North Dakota (Schantz, 1950: 197–198): near Wilton; near Minot.

An unexplained extralimital occurrence is Old Fort Point, Lake Athabasca, Alberta (J. E. Moore, 1952:253).

Urocyon cinereoargenteus orinomus Goldman

1938. *Urocyon cinereoargenteus orinomus* Goldman, Jour. Washington Acad. Sci., 28:497, November 15, type from Orizaba, Veracruz.

MARGINAL RECORDS (Goldman, 1938d:498, unless otherwise noted).—San Luis Potosí: El Salto (Dalquest, 1953b:177). Veracruz: *3 km. E Las Vigas, 8,000 ft.* (19277 KU); Jalapa; 15 km. W Piedras Negras, 300 ft. (19275 KU); 24 km. E and 7 km. S Jesús Carranza (39435 KU). Chiapas: Pueblo Nuevo Solisthuacán (Booth, 1957: 16). Oaxaca: 2 mi. E Juchitán (54821 KU); Totontepec. Querétaro: Jalpan. San Luis Potosí: Río Verde.

Urocyon cinereoargenteus peninsularis Huey

1928. *Urocyon cinereoargenteus peninsularis* Huey, Trans. San Diego Soc. Nat. Hist., 5:203, September 1, type from San Ignacio, Cape Region, Baja California.

MARGINAL RECORDS.—Baja California: type locality; Cape San Lucas (Burt and Hooper, 1941:6).

Urocyon cinereoargenteus scottii Mearns

1891. *Urocyon virginianus scottii* Mearns, Bull. Amer. Mus. Nat. Hist., 3:236, June 5, type from Pinal Co., Arizona.
1895. *Urocyon cinereo-argenteus scottii*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:253, June 29.
1897. *Urocyon cinereoargenteus texensis* Mearns, Preliminary diagnoses of new mammals of the genera *Lynx*, *Urocyon*, *Spilogale* and *Mephitis*, from the Mexican boundary line, p. 2, January 12 (preprint of Proc. U.S. Nat. Mus., 20:459, December 24, 1897), type from San Pedro, near Eagle Pass, Maverick Co., Texas.
1904. *Urocyon cinereo-argenteus inyoensis* Elliot, Field Columb. Mus., Publ. 90, Zool. Ser., 3:268, March 7, type from Beveridge Canyon, Inyo Mts., Inyo Co., California.

MARGINAL RECORDS.—Colorado: Loveland (Cary, 1911:176); near Colorado Springs (Warren, 1942:90); southern Bent County (Cary, 1911:176). Texas: Brazos (V. Bailey, 1905:182); Mason County (Beuchner, 1944: 185); Rockport (V. Bailey, 1905:182). Tamaulipas: near Marmolejo, San Carlos Mts. (Dice, 1937:250); La Joya de Salas (Goodwin, 1954:14). Durango: Río Ocampo (J. A. Allen, 1904:210). Chihuahua: Mojarachic (Knobloch, 1942:297). Arizona: Organ Pipe Cactus National Monument (Huey, 1942:360). California (Grinnell, *et al.*, 1937: 436, unless otherwise noted): Bard (Huey, 1928:207); Santa Rosa Mts.; Palm Springs; Mazourka Canyon, Inyo Mts.; *12 mi. W Big Pine*; Cottonwood Creek, White Mts. Nevada (Hall, 1946:242): *Silver Peak Range*; Millet P.O.; *foothills White Pine Mts.*; Cherry Creek Canyon. Utah: mouth of Birch Creek (Durrant *et al.*, 1955:78); near Parowan (Durrant, 1952:405); 12 mi. W Roosevelt (*ibid.*). Colorado: Yampa Canyon, Bear River (Cary, 1911:176).

Urocyon cinereoargenteus townsendi Merriam

1899. *Urocyon californicus townsendi* Merriam, N. Amer. Fauna, 16:103, October 28, type from Baird, Shasta Co., California.
1933. *Urocyon cinereoargenteus townsendi*, Grinnell, Univ. California Publ. Zool., 40(2):110, September 26.
1910. *Urocyon californicus sequoiensis* Dixon, Univ. California Publ. Zool., 5(7):303, February 12, type from Lagunitas, Marin Co., California.

MARGINAL RECORDS.—Oregon (V. Bailey, 1936:286): Portland; The Dalles; Skeleton Cave, near Bend. California (Grinnell, *et al.*, 1937:430): type locality; Goldrun; Yosemite Valley; Nacimiento, thence up coast to mouth of Columbia River.

Urocyon littoralis
Island Gray Fox

External measurements: 590–787; 110–290; 98–157. Condylobasal length of skull, 92.1–105.6.

Urocyon littoralis catalinae Merriam

1903. *Urocyon catalinae* Merriam, Proc. Biol. Soc. Washington, 16:74, May 29, type from Santa Catalina Island, California. Known only from the type locality.
1937. *Urocyon littoralis catalinae,* Grinnell, Dixon, and Linsdale, The fur-bearing mammals of California, 2:467, August 10.

Urocyon littoralis clementae Merriam

1903. *Urocyon clementae* Merriam, Proc. Biol. Soc. Washington, 16:75, May 29, type from San Clemente Island, California. Known only from the type locality.
1930. [*Urocyon littoralis*] *clementae,* Grinnell and Linsdale, Proc. Biol. Soc. Washington, 43:154, September 26.

Urocyon littoralis dickeyi Grinnell and Linsdale

1930. *Urocyon littoralis dickeyi* Grinnell and Linsdale, Proc. Biol. Soc. Washington, 43:154, September 26, type from San Nicolas Island, California. Known only from the type locality.

Urocyon littoralis littoralis (Baird)

1858. *Vulpes* (*Urocyon*) *littoralis* Baird, Mammals, *in* Repts. Expl. Surv. . . . 8(1):143, July 14, type from San Miguel Island, California. Known only from the type locality.
1888. *Urocyon littoralis,* Merriam, Proc. Biol. Soc. Washington, 4:135, February 18.

Urocyon littoralis santacruzae Merriam

1903. *Urocyon littoralis santacruzae* Merriam, Proc. Biol. Soc. Washington, 16:75, May 29, type from Santa Cruz Island, California. Known only from the type locality.

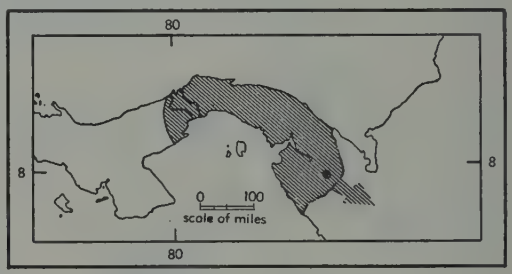
Urocyon littoralis santarosae Grinnell and Linsdale

1930. *Urocyon littoralis santarosae* Grinnell and Linsdale, Proc. Biol. Soc. Washington, 43:154, September 26, type from Santa Rosa Island, California. Known only from the type locality.

Genus Speothos Lund—Bush Dogs

1839. *Speothos* Lund, Ann. Sci. Nat. Paris, ser. 2 (Zool.), 11:223–224, 232, April. Type, *Speothos pacivorus* Lund (from bone caves in Minas Garaës, Brazil).
1843. *Icticyon* Lund, Overs. Danske Vidensk. Selsk. Forh., Kjöbenhavn, p. 80. Type, *Icticyon venaticus* Lund.
1846. *Cynalicus* Gray, Ann. Mag. Nat. Hist., 17:293. Type, *Cynalicus melanogaster* Gray [= *Icticyon venaticus* Lund].
1849. *Melictis* Schinz, Revue Zool., p. 177. Type, *Melictis beskii* Schinz [= *Icticyon venaticus* Lund].

Legs and tail short; hair long; molars $\frac{2}{2}$; in m1 talonid trenchant and inner cusp (metaconid) absent.



Map 450. *Speothos panamensis.*

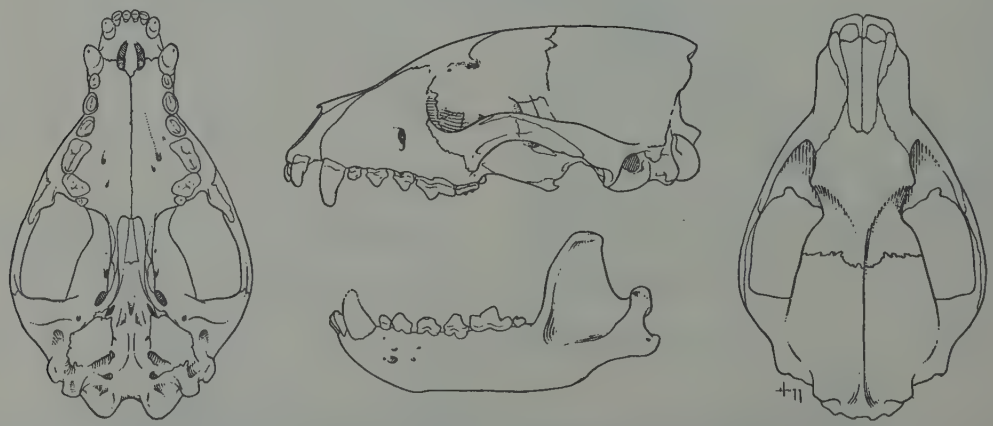


Fig. 473. *Speothos panamensis,* Mount Pirre, near head Río Limón, Panamá, No. 179046 U.S.N.M., ♀, drawn from photograph, X approximately ½.

Speothos panamensis (Goldman)
Panamá Bush Dog

1912. *Icticyon panamensis* Goldman, Smiths. Miscl. Coll., 60(2):14, September 20, type from head of Río Limón, 5000 ft., Mt. Pirre, eastern Panamá. Known only from the type locality.

Characters those of the genus. This nominal species differs from the South American *S. venaticus* in the whitish color of the anterior part of the body.

The latter is said to feed mostly on rodents and occasionally to hunt in packs. It is said also to enter the water readily.

FAMILY URSIDAE—Bears

Large, heavily built, plantigrade, tail short; pentadactyl, claws not retractile; tympanic bullae not inflated; alisphenoid canal present (except in *Aeluropus*); no entepicondylar foramen in humerus; kidneys conglomerate; molars with broad flat tubercular crowns; 4th upper premolar lacking 3rd or inner root; first 3 premolars of each jaw usually rudimentary or lost. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{2}{3}$.

Bears are omnivorous. The females are monestrous, implantation is delayed, mating takes place in spring or early summer, and 1 to 4 young are born after a gestation period of 6 to 8 months.

KEY TO NORTH AMERICAN GENERA OF URSIDAE

1. Always entirely white; combined length of M1 and M2 less than palatal width; confined to arctic regions; primarily maritime. *Thalarctos*, p. 876

1′. Never entirely white (*Ursus americanus kermodei* nearly so but with brownish muzzle); combined length of M1 and M2 never less than palatal width; never maritime and not confined to Arctic region. . . . . *Ursus*, p. 865

Genus Ursus Linnaeus—Black and Brown Bears

1758. *Ursus* Linnaeus, Syst. nat., ed. 10, 1:47. Type, *Ursus arctos* Linnaeus.

1825. *Danis* Gray, Ann. Philos., 26:60. July. Type, *Ursus ferox* Desmarest [= *Ursus horribilis* Ord, 1815].

1865. *Euarctos* Gray, Proc. Zool. Soc. London, for 1864, p. 692, May. Type, *Ursus americanus* Pallas, 1780. Valid as a subgenus.

1898. *Ursarctos* Heude, Mém. N. H. Emp. China 4, 1:17. Type, *Ursus arctus* [*sic*] *yesoensis* Lydekker, 1897 [= *Ursus arctos lasiotus* Gray, 1867].

1918. *Vetularctos* Merriam, N. Amer. Fauna, 41:131, February 9. Type, *Vetularctos inopinatus* Merriam, 1918.

1923. *Mylarctos* Lönnberg, Proc. Zool. Soc. London, p. 91, April 12. Type, *Ursus pruinosus* Blyth, 1854.

Size medium to large; color varying from black or brown to tan and in *U. americanus kermodei* nearly white; soles of feet not haired; head relatively large. Canines and incisors smaller and less recurved than in *Thalarctos*; combined length of M1 and M2 not less than palatal width.

Some species of the genus occur in most of the Northern Hemisphere. The range of the genus overlaps that of *Thalarctos* in a narrow zone along the Arctic coast, at least in North America.

These bears are omnivorous and in the higher life-zones sleep for most of the winter.

Subgenus Euarctos Gray—Black Bear

1865. *Euarctos* Gray, Proc. Zool. Soc. London, for 1864, p. 692, May. Type, *Ursus americanus* Pallas, 1780.

Front claws approximately same length as hind claws; M1 with broad open cuspless valley medially between metaconid and entoconid; p4 without medial accessory cusps or median anteroposterior sulcus on posterior part; M2 broadest at a point approximately halfway between anterior and posterior margins.

Ursus americanus
Black Bear

Canadian forms reviewed by Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, for 1944, pp. 17–33, November 2, 1945.

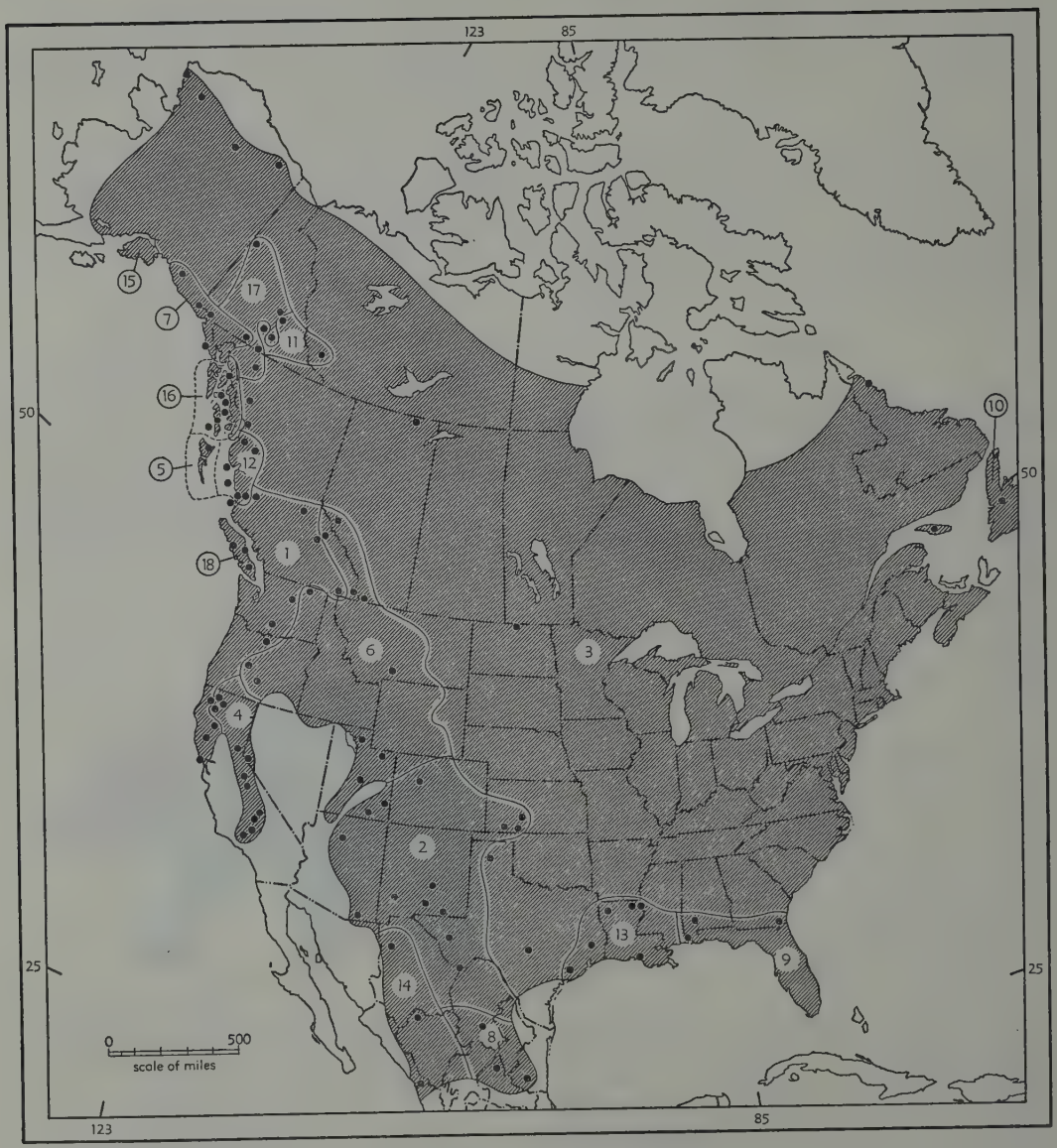
See characters of the subgenus.

Ursus americanus altifrontalis Elliot

1903. *Ursus altifrontalis* Elliot, Field Columb. Mus., Publ. 80, Zool. Ser., 3:234, August 27, type from Lake Crescent, Clallam Co., Washington.

1913. *Ursus americanus altifrontalis*, Grinnell, Proc. California Acad. Sci., ser. 4, 3:248, August 28.

MARGINAL RECORDS.—British Columbia: Indianpoint Lake (Hall, 1934:365); Glacier National Park (Anderson, 1947:37); Yahk (*ibid.*). Washington (Dalquest, 1948:176):



Map 451. *Ursus americanus.*

1. *U. a. altifrontalis*
2. *U. a. amblyceps*
3. *U. a. americanus*
4. *U. a. californiensis*
5. *U. a. carlottae*
6. *U. a. cinnamomum*
7. *U. a. emmonsii*
8. *U. a. eremicus*
9. *U. a. floridanus*
10. *U. a. hamiltoni*
11. *U. a. hunteri*
12. *U. a. kermodei*
13. *U. a. luteolus*
14. *U. a. machetes*
15. *U. a. perniger*
16. *U. a. pugnax*
17. *U. a. randi*
18. *U. a. vancouveri*

Fig. 474. *Ursus americanus californiensis*, 6 mi. N Weldon, Kern Co., California, No. 16269 M.V.Z., ♂, X ¼.

Chelan; Signal Peak. Oregon: Dufur (V. Bailey, 1936:321). California: divide between Grizzly Creek and Salmon River (Grinnell, *et al.*, 1937:98); vicinity of Yolla Bolly Mtn. (Grinnell, 1933:96); summit Sanhedrin Mtn. (Grinnell, *et al.*, 1937:98); vicinity of Bodega (Grinnell, 1933:96), thence northward along coast to British Columbia: Rivers Inlet (Anderson, 1947:37); Hagensborg (Anderson, 1945: 46).

Ursus americanus amblyceps Baird

1859. *Ursus amblyceps* Baird, Rept. U. S. and Mexican boundary Surv., 2(2):29, January, type from Fort Webster (copper mines), on the Gila River, long. 108° 04′ W, lat. 32° 47′ N, Grant Co., New Mexico.

1905. *Ursus americanus amblyceps*, V. Bailey, N. Amer. Fauna, 25:187, October 24.

MARGINAL RECORDS.—Colorado: Dotsero (Durrant, 1952:409). Kansas (Cockrum, 1952:240): Kiowa County; Comanche County; small canyon just south of Meade. New Mexico (V. Bailey, 1932:350–352): Capitan; Guadalupe Mts. Texas: 15 mi. N Fort Davis (Blair, 1940:23); Chisos Mts. (Borell and Bryant, 1942:13). New Mexico: Sacramento Mts. (V. Bailey, 1932:352); type locality. Arizona: near Wakefield Mine, Huachuca Mts. (Hoffmeister and Goodpaster, 1954:70); South Rim of Grand Canyon (V. Bailey, 1935:34). Utah (Durrant, 1952:410): 10 mi. W Monticello, Indian Creek, Abajo Mts.; Castle Creek. Baker (1956:300) identifies specimens from northern Coahuila as *U. a. eremicus*, thus modifying our previously prepared Map 451, which suggests that *U. a. amblyceps* occurs in the area concerned.

Ursus americanus americanus Pallas

1780. *Ursus americanus* Pallas, . . . Spicilegia zoologica, . . . , fasc. 14:5. Type locality, eastern North America.

1898. *Ursus* (*Euarctos*) *americanus sornborgeri* Bangs, Amer. Nat., 32:500, July, type from Okkak, Labrador. (See Bangs, in Grenfell's Labrador, the Country and the People, p. 467, 1909, and J. A. Allen, Bull. Amer. Mus. Nat. Hist., 28:1–5, January 5, 1910.)

1913. *Ursus arctos schwenki*, Shoemaker, Stories of great Pennsylvania hunters, p. 25, type from Union County, Pennsylvania. Trimmings from the skin on which this name was based are in the U.S. National Museum.

MARGINAL RECORDS.—Alaska: Carnivore Lakes (Bee and Hall, 1956:199). Alberta: Wood Buffalo Park (Anderson, 1945:45). Labrador: Okkak (Miller, 1924:90). Quebec: Anticosti Island (Anderson, 1945:44); thence down Atlantic Coast to Georgia and west to Texas (V. Bailey, 1905:186–187): 7 mi. from Kerrville; Prairie Dog Fork near Washburn. North Dakota: Turtle Mts. (V. Bailey, 1927: 191). British Columbia (Swarth, 1922:160): 122 mi. S Telegraph Creek; 31 mi. S Telegraph Creek. Alaska: Cape Thompson (Bee and Hall, 1956:199); Kupowruk River (*ibid.*); near mouth of Inukpasukruk Creek (Rausch, 1951:171).

Ursus americanus californiensis J. Miller

1900. *Ursus californiensis* J. Miller, True bear stories, Rand McNally and Co., Chicago and New York, p. 250. Type locality, "California." Restricted to Sierra Nevada (Grinnell, Univ. California Publ. Zool., 32:401, July 19, 1929).

1929. *Ursus americanus californiensis*, Grinnell, Univ. California Publ. Zool., 32:396, July 19.

MARGINAL RECORDS (Grinnell, *et al.*, 1937:95–96, unless otherwise noted).—California: Callahan; McCloud; *McCloud River near Baird Station.* Nevada: W side Washoe Valley, 1 mi. S Bowers Mansion (16232 KU). California: South Fork, Kern River; 6 mi. N Weldon; Tehachapi Mts. (Grinnell, 1933:96); about 7 mi. SE Tejon Ranch; near Wawona; Crocker's [= Sequoia]; Soda Springs; South Fork Salmon River, 8000 ft.

Ursus americanus carlottae Osgood

1901. *Ursus* (*Euarctos*) *carlottae* Osgood, N. Amer. Fauna, 21:30, September 26, type from Massett, Graham Island, Queen Charlotte Islands, British Columbia. Known only from Queen Charlotte Islands.
1928. *Ursus americanus carlottae*, Hall, Univ. California Publ. Zool., 30:235, March 2.

Ursus americanus cinnamomum Audubon and Bachman

1854. *Ursus americanus* var. *cinnamomum* Audubon and Bachman, The viviparous quadrupeds of North America, 3:125, type from Lower Clearwater River, Camp Chopunnish, near mouth of Jim Ford Creek, Clearwater Co., western Idaho (see V. Bailey, N. Amer. Fauna, 55:319, August 29, 1936).

MARGINAL RECORDS.—Alberta (Anderson, 1947:37): Jasper National Park; Waterton Lakes National Park. Montana: 14 mi. E and 7 mi. S Livingston (Durrant, 1952: 409). Utah (Durrant, 1952:410): Elk Park; 6 mi. above mouth Nine Mile Canyon; North Ogden Canyon. Oregon (V. Bailey, 1936:321): Silver Lake; La Pine. Washington: Republic (Dalquest, 1948:176). British Columbia (Anderson, 1947:37): Morrissey; Glacier National Park.

Ursus americanus emmonsii Dall

1895. [*Ursus americanus*] var. *emmonsii* Dall, Science, n. s., 2:87, July 26, based on specimens from Saint Elias Alps, near Yakutat Bay, Alaska.
1897. *Ursus glacilis* [*sic*] Kells, Canadian Nat. Sci. News, 1:12, April. (Name was applied to the kind of bear living on Mt. Saint Elias, Alaska.)

MARGINAL RECORDS.—Alaska: Camp Rubrick, Chitina River (Anderson, 1945:48); type locality; base Mt. Cook (Swarth, 1911:148). Yukon: mountains behind Lake Bennett, 10 mi. N British Columbia border (Anderson, 1945:48). Alaska (Swarth, 1911:147–148): Lituya Bay, near Mt. Fairweather; thence northward along coast to point of beginning.

Ursus americanus eremicus Merriam

1904. *Ursus americanus eremicus* Merriam, Proc. Biol. Soc. Washington, 17:154, October 6, type from Sierra Guadalupe, Coahuila.

MARGINAL RECORDS.—Coahuila: type locality. Tamaulipas: Agua Linda (Goodwin, 1954:14). San Luis Potosí: near Matehuala (Dalquest, 1953b:178). Baker (1956:300) refers specimens from all of Coahuila to *U. a. eremicus*, whereas our previously prepared map, 451, suggested that *U. a. amblyceps* occurred in northern Coahuila.

Ursus americanus floridanus Merriam

1896. *Ursus floridanus* Merriam, Proc. Biol. Soc. Washington, 10:81, April 13, type from Key Biscayne, Dade Co., Florida.

MARGINAL RECORDS.—Alabama: Carlton (Howell, 1921:30). Georgia: Okefinokee Swamp (Harper, 1927: 282); thence throughout peninsular Florida to Alabama: near Bayou Labatre (Howell, 1921:30).

Ursus americanus hamiltoni Cameron

1957. *Ursus americanus hamiltoni* Cameron, Jour. Mamm., 37:538, January 9, type from Big Falls, Humber River, Newfoundland. Known only from the Island of Newfoundland.

Ursus americanus hunteri (Anderson)

1945. *Euarctos hunteri* Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, for 1944, p. 22, November 2, type from near mouth of Prairie Creek, South Nahanni River, Mackenzie.

MARGINAL RECORDS (Anderson, 1945:25).—Yukon: Pelly River, near junction with Ross River, mile 138 on Canol Road. Mackenzie: type locality. Yukon: Nisutlin River, 24 mi. from Johnson Crossing.

Ursus americanus kermodei Hornaday

1905. *Ursus kermodei* Hornaday, Ninth Annual Report N. Y. Zool. Soc., for 1904, p. 82, January, type from Gribble Island, British Columbia.
1928. *Ursus americanus kermodei*, Hall, Univ. California Publ. Zool., 30:235, March 2.

MARGINAL RECORDS.—British Columbia: N of Nass River (Anderson, 1947:37); Hazelton, Skeena River (Anderson, 1945:28); South Bentinck Arm (Anderson, 1947: 37); Burke Channel, Kwatna Inlet (Anderson, 1945:28); Aristazable Island (G. M. Allen, 1942a:139); Pitt Island (*ibid.*).

Ursus americanus luteolus Griffith

1821. *Ursus luteolus* Griffith, Class Quadrimembria, order Carnivora, general and particular description of carnivorous animals . . . , p. 236. Type locality, Louisiana.

MARGINAL RECORDS.—Louisiana (Lowery, 1943:224–225): Mer Rouge; East Carrol Parish; Morgan City. Texas (V. Bailey, 1905:189): Wharton; Tarkington; *Kountze*. Louisiana: Bayou Bodcau, near Sarepeta (Lowery, 1936:19).

Ursus americanus machetes Elliot

1903. *Ursus machetes* Elliot, Field Columb. Mus., Publ. 80, Zool. Ser., 3:235, September 3, type from Casas Grandes, Sierra Madre, Chihuahua.

MARGINAL RECORDS.—Chihuahua: type locality. Durango: Río Ocampo (J. A. Allen, 1904:210). Sinaloa: vicinity of Escuinapa (J. A. Allen, 1906:225).

Ursus americanus perniger J. A. Allen

1910. *Ursus americanus kenaiensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 28:6, January 5, type from Homer, Kenai Peninsula, Alaska. Not *Ursus kenaiensis* Merriam, 1904.
1910. *Ursus americanus perniger* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 28:115, April 30, a renaming of *Ursus americanus kenaiensis* J. A. Allen. Known only from the Kenai Peninsula.

Ursus americanus pugnax Swarth

1911. *Ursus americanus pugnax* Swarth, Univ. California Publ. Zool., 7:141, January 12, type from Rocky Bay, now Bobs Bay, Dall Island, Alaska.

MARGINAL RECORDS (Swarth, 1911:142–143).—Alaska: Taku River; Mitkof Island; Fools Inlet, Wrangell Island; San Alberto Bay, Prince of Wales Island; type locality; Kupreanof Island.

Ursus americanus randi (Anderson)

1945. *Euarctos randi* Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, for 1944, p. 19, November 2, type from Sheldon Mtn., Canol Road, Mile 222, Yukon.

MARGINAL RECORDS.—Yukon: Klondike region (Anderson, 1947:38); *type locality*; Sheldon Lake, Canol Road, Mile 222 (Anderson, 1945:22); *Pelly River, Canol Road, Mile 139* (*ibid.*); Nisutlin River (Anderson, 1947:38); 15 mi. NE Teslin Post (Anderson, 1945:22). British Columbia: head of Teslin Lake (Anderson, 1947:38).

Ursus americanus vancouveri Hall

1928. *Ursus americanus vancouveri* Hall, Univ. California Publ. Zool., 30:231, March 2, type from King Solomon's Basin, Vancouver Island, British Columbia.

MARGINAL RECORDS (Anderson, 1945:32).—Vancouver Island: Nootka Sound; Comox; Cowichan Lake. Confined to Vancouver Island.

Subgenus **Ursus** Linnaeus—Grizzly and Big Brown Bears

North American forms revised by Merriam, N. Amer. Fauna, 41:1–136, 16 pls., February 9, 1918. Eurasian forms revised by Couturier, "L'Ours Brun," printed in Grenoble, France, xiv + 905 pp., frontispiece, 83 pls., 43 figs., 1954.

1758. *Ursus* Linnaeus, Syst. nat., ed. 10, 1:47. Type, *Ursus arctos* Linnaeus.

Front claws longer than hind claws; m1 with one or more cusplets medially in valley between metaconid and entoconid; p4 with median accessory cusps and a median anteroposterior sulcus on posterior part; M2 broadest at anterior end.

The subgenus *Ursus* contains 87 named kinds in North America. It seems almost certain that the majority of these are at most subspecifically distinct. Since the home range of an individual grizzly bear has been known to cover an area 45 miles in diameter in Colorado (Warren, 1942:43); and since 3 full species have been described within a distance of 100 miles in that state, it seems possible that some of the names may have been applied to family groups of bears. However this may be, the relationships of many of the named kinds probably never will be understood fully, at least for those kinds which formerly occurred in those parts of the United States where the grizzly now is extinct.

In the following accounts all the named kinds are listed together with their type localities, which are shown on Map 452. No attempt is made at descriptions of the species. Marginal records for the subgenus *Ursus* in North America are as follows:

MARGINAL RECORDS.—Alaska: Alaktak River [154° 58′, 70° 47′] (Rausch, 1951:165), eastward along (or to within a few miles of) the arctic coast to Keewatin: Baker Lake (Anderson, 1947:43). Minnesota: Sandhill River (Swanson, 1945:62). Kansas: Trego County (Cockrum, 1952:239). Texas: Davis Mts. (Merriam, 1918:35). Durango: "southern Durango" (G. M. Allen, 1942a:153). Baja California: Sierra Juárez near Santa Catarina Mission (G. M. Allen, 1942a:145) thence northward along the Pacific Coast of North America to point of beginning.

Ursus absarokus Merriam

1914. *Ursus absarokus* Merriam, Proc. Biol. Soc Washington, 27:181, August 13, type from head of Little Bighorn River, northern part of Bighorn Mts., Carbon Co., Montana.

Ursus alascensis Merriam

1896. *Ursus horribilis alascensis* Merriam, Proc. Biol. Soc. Washington, 10:74, April 13, type from Unalaklik River, Alaska.
1918. *Ursus alascensis* Merriam, N. Amer. Fauna, 41:94, February 9.

Ursus alexandrae Merriam

1914. *Ursus alexandrae* Merriam, Proc. Biol. Soc. Washington, 27:174, August 13, type from Kasilof Lake, Kenai Peninsula, Alaska.

Ursus andersoni Merriam

1918. *Ursus andersoni* Merriam, N. Amer. Fauna, 41:83, February 9, type from E branch Dease River, near Great Bear Lake, Mackenzie.

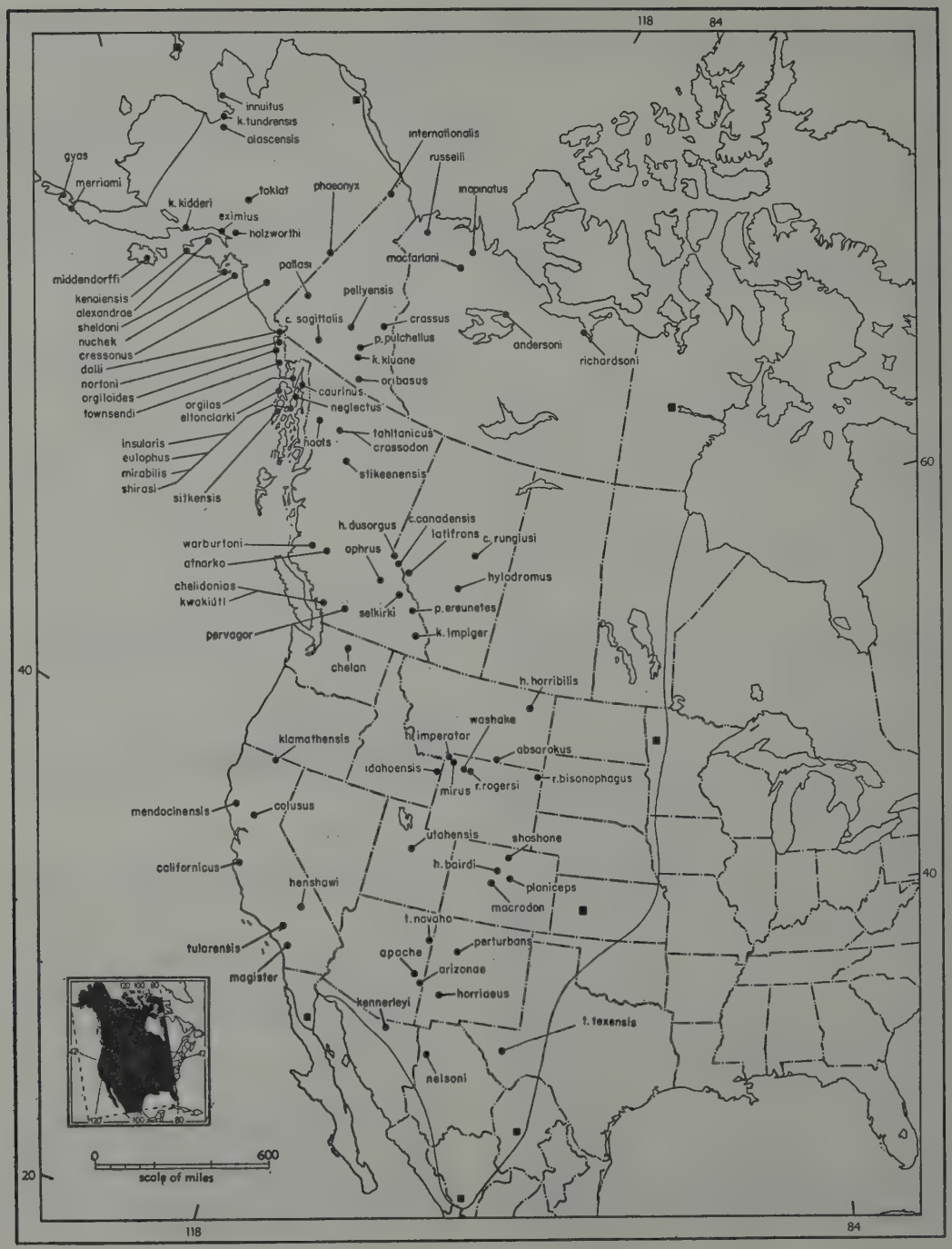
Ursus apache Merriam

1916. *Ursus apache* Merriam, Proc. Biol. Soc. Washington, 29:134, September 6, type from Whorton Creek, S slope White Mts., a few miles W Blue, Greenlee Co., Arizona.

Ursus arctos beringianus Middendorff

1853. *Ur*[*sus*]. *arctos* var. *beringiana* Middendorff, Reise in den äussersten Norden und Osten Sibiriens . . . , 2(2): pl. 1, figs. 1–6. Type locality, Great Shantar Island, Sea of Okhotsk, Siberia.
1855. *Ursus piscator* Pucheran, Revue et Mag. Zool., Paris, ser. 2, 7:392, August. Type locality, Petropaulovski, southern Kamtchatka.
1924. *U*[*rsus*]. *a*[*rctos*]. *kolymnensis* Ognev, Priroda i Okhota na Ukraine (Nature and sport in Ukraine), Kharkov, 1(2):112, type from Saborzevo, Kolyma River, northwest of Sea of Okhotsk, Anadirsk District, Siberia.

MARGINAL RECORDS.—Alaska: St. Lawrence Island (A. H. Howell, 1940:216; Rausch, 1953:19).


118
84
60
40
20
innuitus
k.tundrensis
alascensis
gyas
merriami
k.kidderi
toklat
eximius
holzworthi
phaeonyx
internationalis
russelli
inopinatus
macfarlani
middendorffi
kenaiensis
alexandrae
sheldoni
nuchek
cressonus
dalli
nortoni
orgilioides
townsendi
orgilos
eltonclarki
insularis
eulophus
mirabilis
shirasi
sitkensis
pallasi
pallyensis
c. sagittalis
crassus
p.pulchellus
k.kluane
oribasus
caurinus
neglectus
tahltanicus
crassodon
hoots
stikeenensis
andersoni
richardsoni
h.dusorgus
c.canadensis
latifrons
c. rungiusi
warburtoni
atnarko
aphrus
chelidonias
kwakiutl
selkirki
p.ereunetes
hylodromus
k.impiger
pervagor
chelan
h.horribilis
washake
klamathensis
h.imperator
absarokus
idahoensis
mirus
r.rogersi
r.bisonophagus
mendocinensis
colusus
utahensis
shoshone
californicus
h.bairdi
planiceps
henshawi
macrodon
t.navaho
perturbans
tularensis
apache
arizonae
magister
horriaeus
kennerleyi
t.texensis
nelsoni
0
600
scale of miles

Ursus arizonae Merriam

1916. *Ursus arizonae* Merriam, Proc. Biol. Soc. Washington, 29:135, September 6, type from east side Escudilla Mts., Apache Co., Arizona.

Ursus atnarko Merriam

1918. *Ursus atnarko* Merriam, N. Amer. Fauna, 41:22, February 9, type from Lonesome Lake, Atnarko River, one of the upper forks of the Bella Coola, British Columbia.

Ursus californicus Merriam

1896. [*Ursus horribilis*] subspecies *californicus* Merriam, Proc. Biol. Soc. Washington, 10:76, April 13, type from Monterey, Monterey Co., California.
1914. *Ursus californicus* Merriam, Proc. Biol. Soc. Washington, 27:188, August 13.

Ursus canadensis canadensis Merriam

1914. *Ursus shoshone canadensis* Merriam, Proc. Biol. Soc. Washington, 27:184, August 13, type from Moose Pass, near Mt. Robson, British Columbia.
1947. *Ursus canadensis canadensis*, Anderson, Bull. Nat. Mus. Canada, 102:41, January 24.
1916. *Ursus ophrus* Merriam, Proc. Biol. Soc. Washington, 29:148, September 6, type from eastern British Columbia; exact locality unknown (arranged as a synonym of *canadensis* by Anderson *supra*).

Ursus canadensis rungiusi Merriam

1918. *Ursus rungiusi rungiusi* Merriam, N. Amer. Fauna, 41:49, February 9, type from Rocky Mountains on headwaters on Athabaska River, Alberta.
1947. *Ursus canadensis rungiusi*, Anderson, Bull. Nat. Mus. Canada, 102:41, January 24.

Ursus canadensis sagittalis Merriam

1918. *Ursus rungiusi sagittalis* Merriam, N. Amer. Fauna, 41:50, February 9, type from Champagne Landing, southwestern Yukon.
1947. *Ursus canadensis sagittalis*, Anderson, Bull. Nat. Mus. Canada, 102:41, January 24.

Ursus caurinus Merriam

1914. *Ursus caurinus* Merriam, Proc. Biol. Soc. Washington, 27:187, August 13, type from Berners Bay, E side Lynn Canal, southeastern Alaska.

Ursus chelan Merriam

1916. *Ursus chelan* Merriam, Proc. Biol. Soc. Washington, 29:136, September 6, type from T. 30 N, R. 16 E, Willamette Meridian, Wenatchee National Forest, E slope Cascade Mts., northern Chelan Co., Washington.

Ursus chelidonias Merriam

1918. *Ursus chelidonias* Merriam, N. Amer. Fauna, 41:21, February 9, type from head of Jervis Inlet, British Columbia.

Ursus colusus Merriam

1914. *Ursus colusus* Merriam, Proc. Biol. Soc. Washington, 27:187, August 13, type from Sacramento River, probably between Colusa and Sacramento, California.

Ursus crassodon Merriam

1918. *Ursus crassodon* Merriam, N. Amer. Fauna, 41:90, February 9, type from Klappan Creek (Third South Fork, Stikine River), British Columbia.

Ursus crassus Merriam

1918. *Ursus crassus* Merriam, N. Amer. Fauna, 41:90, February 9, type from upper Macmillan River, Yukon.

Ursus cressonus Merriam

1916. *Ursus cressonus* Merriam, Proc. Biol. Soc. Washington, 29:137, September 6, type from Lakina River, S slope Wrangell Range, Alaska.

Ursus dalli Merriam

1896. *Ursus dalli* Merriam, Proc. Biol. Soc. Washington, 10:71, April 13, type from Yakutat Bay (NW side), Alaska.

Ursus eltonclarki Merriam

1914. *Ursus eltonclarki* Merriam, Proc. Biol. Soc. Washington, 27:175, August 13, type from Freshwater Bay, Chichagof Island, Alaska.

Ursus eulophus Merriam

1904. *Ursus eulophus* Merriam, Proc. Biol. Soc. Washington, 17:153, October 6, type from Admiralty Island, Alaska.

Map 452. Solid circles denote type localities of nominal species and subspecies in America of the subgenus *Ursus* (grizzlies and big brown bears).
Solid squares denote marginal record stations of occurrence that are not type localities. These record stations, beginning in Alaska and proceeding in clockwise order, are as follows: Alaska: Alaktak River near Admiralty Bay (*Ursus horribilis richardsoni*—Bee and Hall, 1956:196). Keewatin: Baker Lake (*Ursus andersoni*—Anderson, 1947:43). Minnesota: Sandhill River in southern Polk Co. (*Ursus horribilis*—Swanson, 1945:62). Kansas: Trego Co. (*Ursus horribilis horribilis*—Cockrum, 1952:239). Coahuila: vicinity of Cuatro Ciénegas (*Ursus* sp.—Baker, 1956:301). Durango: southern Durango (*Ursus nelsoni*—G. M. Allen, 1942a:1953). Baja California: Sierra Juárez near Santa Catarina Mission (grizzly bear—G. M. Allen, 1942a: 145). Alaska: St. Lawrence Island (*Ursus arctos beringianus*—Rausch, 1953:19).

Ursus eximius Merriam

1916. *Ursus eximius* Merriam, Proc. Biol. Soc. Washington, 29:139, September 6, type from head of Knik, Cook Inlet, Alaska.

Ursus gyas Merriam

1902. *Ursus dalli gyas* Merriam, Proc. Biol. Soc. Washington, 15:78, March 22, type from Pavlof Bay, Alaska Peninsula, Alaska.
1918. *Ursus gyas* Merriam, N. Amer. Fauna, 41:124, February 9.
1902. *Ursus merriami* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:141, April 12, type from Portage Bay, opposite Port Muller, Alaska Peninsula, Alaska.

Ursus henshawi Merriam

1914. *Ursus henshawi* Merriam, Proc. Biol. Soc. Washington, 27:190, August 13, type from southern Sierra Nevada, near Havilah, Kern Co., California.

Ursus holzworthi Merriam

1929. *Ursus holzworthi* Merriam, Proc. Biol. Soc. Washington, 42:173, June 15, type from last slope of Talkeetna Mts., near headwaters of Oshetna or Black River, Alaska.

Ursus hoots Merriam

1916. *Ursus hoots* Merriam, Proc. Biol. Soc. Washington, 29:140, September 6, type from Clearwater Creek, a N. branch of Stikine River, British Columbia.

Ursus horriaeus Baird

1858. *U[rsus]. horribilis* var. *horriaeus* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):224, July 14, type from old copper mines near present town of Santa Rita, Grant Co., New Mexico (see V. Bailey, N. Amer. Fauna, 53:357, March 1, 1932).
1914. [*Ursus*] *horriaeus*, Merriam, Proc. Biol. Soc. Washington, 27:191, August 13.

Ursus horribilis
Grizzly Bear

Ursus horribilis bairdi Merriam

1914. *Ursus bairdi* Merriam, Proc. Biol. Soc. Washington, 27:192, August 13, type from Blue River, Summit Co., Colorado.
1918. *Ursus horribilis bairdi* Merriam, N. Amer. Fauna, 41: 19, February 9.

Ursus horribilis dusorgus Merriam

1918. *Ursus dusorgus* Merriam, N. Amer. Fauna, 41:33, February 9, type from head of Jackpine River, near Mount Bess, close to British Columbian boundary, Alberta.
1947. *Ursus horribilis dusorgus*, Anderson, Bull. Nat. Mus. Canada, 102:39, January 24.

Ursus horribilis horribilis Ord

1815. *Ursus horribilis* Ord, *in* Guthrie, A new geogr., hist., comm. grammar . . . , Philadelphia, 2nd Amer. Ed., 2:291 (described on p. 299). Type locality, Missouri River, a little above mouth of Poplar River, northeastern Montana.
1820. *Ursus cinereus* Desmarest, Mammalogie, p. 164, *in* Encyclopédie méthodique. . . . Type locality, not designated.
1822. *Ursus griseus* Choris, Voyage pittoresque autour du monde, Paris (unpaged). Name applied by Choris to the bear of the interior of North America but Choris identifies his animal with *Ursus griseus* Cuv.
1827. *Ursus candescens* Hamilton-Smith, *in* Griffith's Cuvier, 2:229 (*fide* Griffith, *loc. cit.*).

Ursus horribilis imperator Merriam

1914. *Ursus imperator* Merriam, Proc. Biol. Soc. Washington, 27:180, August 13, type from Yellowstone National Park, Wyoming.
1918. *Ursus horribilis imperator* Merriam, N. Amer. Fauna, 41:20, February 9.

Ursus hylodromus Elliot

1904. *Ursus hylodromus* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3:257, January 7, type from Alberta.
1916. *Ursus selkirki* Merriam, Proc. Biol. Soc. Washington, 29:150, September 6, type from Selkirk Mts., Upper Columbia River, British Columbia. (Regarded as indistinguishable from *U. hylodromus* Elliot by Merriam, N. Amer. Fauna, 41:77, February 9, 1918.)

Ursus idahoensis Merriam

1918. *Ursus idahoensis* Merriam, N. Amer. Fauna, 41:54, February 9, type from north fork Teton River, Fremont Co., Idaho.

Ursus innuitus Merriam

1914. *Ursus innuitus* Merriam, Proc. Biol. Soc. Washington, 27:177, August 13, type from Golofnin Bay, S side of Seward Peninsula, western Alaska.

Ursus inopinatus (Merriam)

1918. *Vetularctos inopinatus* Merriam, N. Amer. Fauna, 41: 132, February 9, type from Rendezvous Lake, NE of Fort Anderson, Mackenzie.
1924. *Ursus inopinatus*, Miller, Bull. U.S. Nat. Mus., 128: 106, April 29.

Ursus insularis Merriam

1916. *Ursus eltonclarki insularis* Merriam, Proc. Biol. Soc. Washington, 29:141, September 6, type from Admiralty Island, southeastern Alaska.
1918. *Ursus insularis* Merriam, N. Amer. Fauna, 41:44, February 9.

Ursus internationalis Merriam

1914. *Ursus internationalis* Merriam, Proc. Biol. Soc. Washington, 27:177, August 13, type from Alaska-Yukon boundary, about 50 mi. S of Arctic Coast. (Arranged as a synonym of *richardsonii* by Bee and Hall, Univ. Kansas Mus. Nat. Hist. Miscl. Publ., 8:189, March 10, 1956.)

Ursus kenaiensis Merriam

1904. *Ursus kenaiensis* Merriam, Proc. Biol. Soc. Washington, 17:154, October 6, type from Cape Elizabeth, extreme W end of Kenai Peninsula, Alaska.

Ursus kennerleyi Merriam

1914. *Ursus kennerleyi* Merriam, Proc. Biol. Soc. Washington, 27:194, August 13, type from mountains near Los Nogales, Sonora.

Ursus kidderi kidderi Merriam

1902. *Ursus kidderi* Merriam, Proc. Biol. Soc. Washington, 15:78, March 22, type from Chinitna Bay, Cook Inlet, Alaska.

Ursus kidderi tundrensis Merriam

1914. *Ursus kidderi tundrensis* Merriam, Proc. Biol. Soc. Washington, 27:196, August 13, type from Shaktolik River, Norton Sound, Alaska.

Ursus klamathensis Merriam

1914. *Ursus klamathensis* Merriam, Proc. Biol. Soc. Washington, 27:185, August 13, type from Beswick, near mouth of Shovel Creek, Klamath River, Siskiyou Co., California.

Ursus kluane impiger Merriam

1918. *Ursus kluane impiger* Merriam, N. Amer. Fauna, 41:81, February 9, type from Columbia Valley, British Columbia.

Ursus kluane kluane Merriam

1916. *Ursus kluane* Merriam, Proc. Biol. Soc. Washington, 29:141, September 6, type from McConnell River, Yukon.

Ursus kwakiutl Merriam

1916. *Ursus kwakiutl* Merriam, Proc. Biol. Soc. Washington, 29:143, September 6, type from Jervis Inlet, coast of southern British Columbia.

Ursus latifrons Merriam

1914. *Ursus phaeonyx latifrons* Merriam, Proc. Biol. Soc. Washington, 27:183, August 13, type from Jasper House, Alberta.

1918. *Ursus latifrons* Merriam, N. Amer. Fauna, 41:97, February 9.

Ursus macfarlani Merriam

1918. *Ursus macfarlani* Merriam, N. Amer. Fauna, 41:51, February 9, type from Anderson River, 50 mi. below Fort Anderson, Mackenzie.

Ursus macrodon Merriam

1918. *Ursus macrodon* Merriam, N. Amer. Fauna, 41:38, February 9, type from Twin Lakes, Lake Co., Colorado.

Ursus magister Merriam

1914. *Ursus magister* Merriam, Proc. Biol. Soc. Washington, 27:189, August 13, type from Los Biacitos, head of San Onofre Canyon, Santa Ana Mts., San Diego Co., California.

Ursus mendocinensis Merriam

1916. *Ursus mendocinensis* Merriam, Proc. Biol. Soc. Washington, 29:145, September 6, type from Long Valley, N of Sherwood, Mendocino Co., California.

Ursus middendorffi Merriam

1896. *Ursus middendorffi* Merriam, Proc. Biol. Soc. Washington, 10:69, April 13, type from Kodiak Island, Alaska.
1911. *Ursus kadiaki* Kleinschmidt, Outdoor Life, 27:3, January. Name applied to the big brown bear of Kadiak Island, Alaska Peninsula, Montague Island, and Yacutat, all in Alaska.

Ursus mirabilis Merriam

1916. *Ursus mirabilis* Merriam, Proc. Biol. Soc. Washington, 29:146, September 6, type from Admiralty Island, Alaska.

Ursus mirus Merriam

1918. *Ursus mirus* Merriam, N. Amer. Fauna, 41:40, February 9, type from Slough Creek, Yellowstone National Park, Wyoming.

Ursus neglectus Merriam

1916. *Ursus kwakiutl neglectus* Merriam, Proc. Biol. Soc. Washington, 29:144, September 6, type from near Hawk Inlet, Admiralty Island, Alaska.
1918. *Ursus neglectus* Merriam, N. Amer. Fauna, 41:28, February 9.

Ursus nelsoni Merriam

1914. *Ursus nelsoni* Merriam, Proc. Biol. Soc. Washington, 27:190, August 13, type from Colonia García, Chihuahua.

Ursus nortoni Merriam

1914. *Ursus nortoni* Merriam, Proc. Biol. Soc. Washington, 27:179, August 13, type from Yakutat, Alaska.

Ursus nuchek Merriam

1916. *Ursus nuchek* Merriam, Proc. Biol. Soc. Washington, 29:146, September 6, type from head Nuchek Bay, Hinchinbrook Island, Prince William Sound, Alaska.

Ursus orgiloides Merriam

1918. *Ursus orgiloides* Merriam, N. Amer. Fauna, 41:46, February 9, type from Italio River, Alaska.

Ursus orgilos Merriam

1914. *Ursus orgilos* Merriam, Proc. Biol. Soc. Washington, 27:176, August 13, type from Bartlett Bay, east side of Glacier Bay, southeastern Alaska.

Ursus oribasus Merriam

1918. *Ursus oribasus* Merriam, N. Amer. Fauna, 41:56, February 9, type from upper Liard River, Yukon, near British Columbian boundary.

Ursus pallasi Merriam

1916. *Ursus pallasi* Merriam, Proc. Biol. Soc. Washington, 29:149, September 6, type from Donjek River, southwestern Yukon.

Ursus pellyensis Merriam

1918. *Ursus pellyensis* Merriam, N. Amer. Fauna, 41:82, February 9, type from Ketza Divide, Pelly Mountains, Yukon.

Ursus perturbans Merriam

1918. *Ursus perturbans* Merriam, N. Amer. Fauna, 41:64, February 9, type from a canyon on Mt. Taylor, 12 mi. E San Mateo, Valencia Co., New Mexico.

Ursus pervagor Merriam

1914. *Ursus pervagor* Merriam, Proc. Biol. Soc. Washington, 27:186, August 13, type from Pemberton [= Lillooet] Lake, British Columbia.

Ursus phaeonyx Merriam

1904. *Ursus horribilis phaeonyx* Merriam, Proc. Biol. Soc. Washington, 17:154, October 6, type from Glacier Mtn., Tanana Mts., Alaska (about 2 mi. below source of Comet Creek, near Fortymile Creek, between Yukon and Tanana rivers).

1914. [*Ursus*] *phaeonyx* Merriam, Proc. Biol. Soc. Washington, 27:183, August 13.

Ursus planiceps Merriam

1918. *Ursus planiceps* Merriam, N. Amer. Fauna, 41:37, February 9, type from Colorado, exact locality unknown, but probably in the foothills or on the western edge of the plains.

Ursus pulchellus ereunetes Merriam

1918. *Ursus pulchellus ereunetes* Merriam, N. Amer. Fauna, 41:56, February 9, type from Beaverfoot Range, Kootenai District, British Columbia.

Ursus pulchellus pulchellus Merriam

1918. *Ursus pulchellus pulchellus* Merriam, N. Amer. Fauna, 41:55, February 9, type from Ross River, Yukon.

Ursus richardsoni Swainson

1838. *Ursus richardsoni* Swainson, Animals in menageries . . . , p. 54. Type locality assumed to be shore of the Arctic Ocean, on W side Bathurst Inlet about 8 mi. from mouth of Hood River, Mackenzie. (Arranged as a subspecies of *Ursus horribilis* by Bee and Hall, Univ. Kansas Mus. Nat. Hist. Miscl. Publ., 8:188, March 10, 1956.)

Ursus rogersi bisonophagus Merriam

1918. *Ursus rogersi bisonophagus* Merriam, N. Amer. Fauna, 41:66, February 9, type from Bear Lodge, Sundance National Forest, Black Hills, Crook Co., Wyoming.

Ursus rogersi rogersi Merriam

1918. *Ursus rogersi rogersi* Merriam, N. Amer. Fauna, 41:65, February 9, type from high up on Greybull River, Absaroka Mts., Yellowstone National Park, Wyoming.

Ursus russelli Merriam

1914. *Ursus russelli* Merriam, Proc. Biol. Soc. Washington, 27:178, August 13, type from Mackenzie Delta, Mackenzie. (Arranged as a subspecies of *Ursus internationalis* by Anderson, *in* Porsild, Canadian Field-Nat., 59:8, August 16, 1945.)

Ursus sheldoni Merriam

1910. *Ursus sheldoni* Merriam, Proc. Biol. Soc. Washington, 23:127, September 2, type from Montague Island, Prince William Sound, Alaska.

Ursus shirasi Merriam

1914. *Ursus shirasi* Merriam, Proc. Biol. Soc. Washington, 27:195, August 13, type from Bybus Bay, Admiralty Island, Alaska.

Ursus shoshone Merriam

1914. *Ursus shoshone* Merriam, Proc. Biol. Soc. Washington, 27:184, August 13, type from Estes Park, Larimer Co., Colorado.

Ursus sitkensis Merriam

1896. *Ursus sitkensis* Merriam, Proc. Biol. Soc. Washington, 10:73, April 13, type from near Sitka, Alaska.

Ursus stikeenensis Merriam

1914. *Ursus stikeenensis* Merriam, Proc. Biol. Soc. Washington, 27:178, August 13, type from Tatletuey Lake, near head of Skeena River, northern British Columbia.

Ursus tahltanicus Merriam

1914. *Ursus tahltanicus* Merriam, Proc. Biol. Soc. Washington, 27:181, August 13, type from Klappan Creek (3rd S. fork of Stikine River), British Columbia.

Ursus texensis navaho Merriam

1914. *Ursus navaho* Merriam, Proc. Biol. Soc. Washington, 27:191, August 13, type from Navajo country near Fort Defiance (Mollhausen), Arizona, type probably killed in 1856 in Chuska Mountains, on boundary between northeastern Arizona and northwestern New Mexico.

1918. *Ursus texensis navaho* Merriam, N. Amer. Fauna, 41:37, February 9.

Ursus texensis texensis Merriam

1914. *Ursus horriaeus texensis* Merriam, Proc. Biol. Soc. Washington, 27:191, August 13, type from Davis Mountains, Jeff Davis Co., Texas.

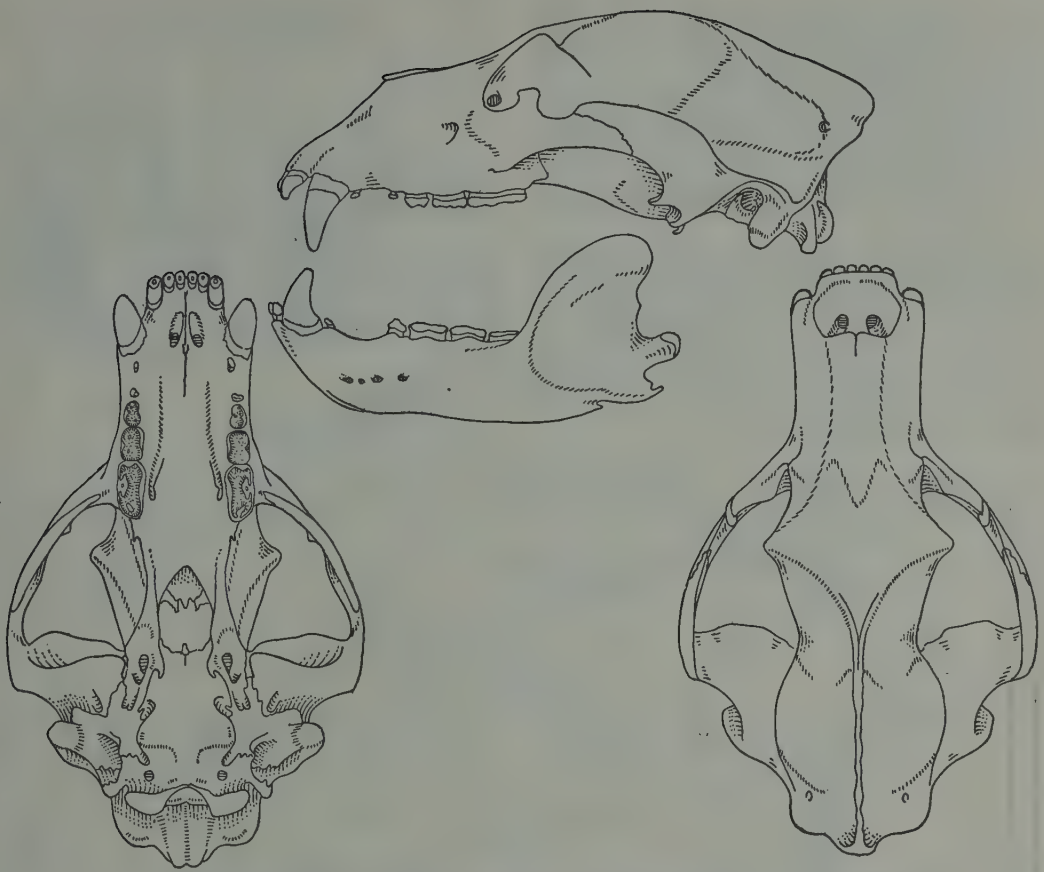


Fig. 475. *Ursus richardsoni*, junction of Chandler and Sic-sic-puk rivers, long. 152° 00′ W, lat. 68° 51′ N, approximately 1800 ft., Brooks Range, Alaska, No. 51562 K.U., probably ♂, X ¼.

1918. ***Ursus texensis texensis*** Merriam, N. Amer. Fauna, 41:35, February 9.

Ursus toklat Merriam

1914. *Ursus toklat* Merriam, Proc. Biol. Soc. Washington, 27:182, August 13, type from head Toklat River, N base Alaska Range, near Mt. McKinley, Alaska.

Ursus townsendi Merriam

1916. *Ursus townsendi* Merriam, Proc. Biol. Soc. Washington, 29:151, September 6, type from mainland of southeastern Alaska, probably between Cross Sound and Alsek River Delta, but exact locality unknown.

Ursus tularensis Merriam

1914. *Ursus californicus tularensis* Merriam, Proc. Biol. Soc. Washington, 27:188, August 13, type from Fort Tejon, Tehachapi Mts., Kern Co., California.

1918. *Ursus tularensis* Merriam, N. Amer. Fauna, 41:30, February 9.

Ursus utahensis Merriam

1914. *Ursus utahensis* Merriam, Proc. Biol. Soc. Washington, 27:193, August 13, type from N. fork Salina Creek, about 10 mi. SE Mayfield, Sanpete Co., Utah.

Ursus warburtoni Merriam

1916. *Ursus kwakiutl warburtoni* Merriam, Proc. Biol. Soc. Washington, 29:145, September 6, type from Atnarko River, British Columbia.

1918. *Ursus warburtoni* Merriam, N. Amer. Fauna, 41:27, February 9.

Ursus washake Merriam

1916. *Ursus washake* Merriam, Proc. Biol. Soc. Washington, 29:152, September 6, type from N. fork of Shoshone River, Absaroka Mts., between Bighorn Basin and Yellowstone Park, Wyoming.

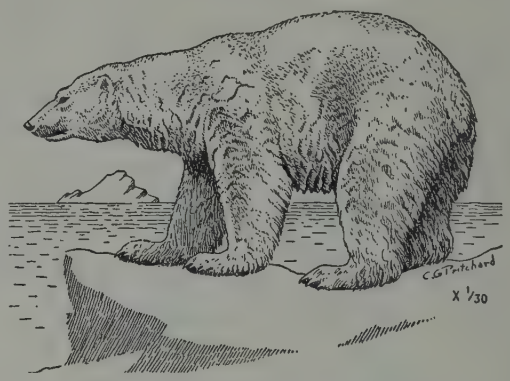
Genus Thalarctos Gray—Polar Bear

Revised by Knottnerus-Meyer, Sitzungsber. Gesell. naturf. Freunde, Berlin, pp. 170–187, July, 1908.

1825. *Thalarctos* Gray, Ann. Philos., n. s., 10:62, July. Type, *Thalarctos polaris* Gray [= *Ursus maritimus* Phipps].
1825. *Thalassarctos* Gray, Ann. Philos., n. s., 10:339, November, an emendation of *Thalarctos* Gray.
1896. *Thalassiarchus* Kobelt, Bericht Senckenberg. naturf. Gesell., Frankfurt am Main, p. 93, an emendation of *Thalarctos* Gray.

Size large; head relatively small; neck relatively long; claws not strongly curved but with well-developed cutting edges; fur dense; color uniformly white or buffy; canines and incisors relatively large and recurved; molars relatively small, the combined length of M1 and M2 less than palatal width; P4 relatively high; braincase relatively long; frontal shield not markedly elevated.

Thalarctos maritimus
Polar Bear



Map 453. Showing the geographic distribution of the polar bear (genus *Thalarctos*) in America. The four solid circles that are connected by means of guide lines to names denote type localities of nominal subspecies. *Thalarctos maritimus maritimus* is the subspecific name that has been applied to populations of polar bears in the western part of the Arctic region. This name has been applied by some authors also to the populations in the eastern part of the Arctic region.

Characters those of genus. Polar bears are essentially marine mammals; they live on ice floes and the arctic coasts and feed principally on seals.

The species is circumpolar. The range map indicates the southern limits of distribution of the species in North America.

RECORDS marking the southern limits of distribution in North America are, from west to east, Alaska: Pribilof Islands (Preble, 1923:103); near St. Michaels (Seton, 1929(2): 198). W. Fork Sagavanirktok River, long. 148° 51′ 00″ W, lat. 68° 55′ 30″ N (Bee and Hall, 1956:203). Mackenzie: Fort MacPherson, Mackenzie River (Cahalane, 1947:154); Teshierpi River, NE Great Slave Lake, about 75 mi. from salt water (*ibid.*). Keewatin: Chesterfield Inlet (Anderson, 1947:47). Manitoba: Churchill (*ibid.*). Ontario: Moose Factory (Seton, 1929(2):198). Quebec: Ungava Bay (type locality of *T. m. ungavensis*); near Killineck, Ungava Bay (Anderson, 1947:47). Labrador: Okak (type locality of *T. labradorensis*). Quebec: Lake St. John, Saguenay River (Cahalane, 1947:154). Newfoundland (Seton, 1929(2): 198). Western Greenland (type locality of *T. m. groenlandicus*). Eastern Greenland (type locality of *T. m. eogroenlandicus*).

Thalarctos maritimus eogroenlandicus (Knottnerus-Meyer)

1908. *Thalassarctos eogroenlandicus* Knottnerus-Meyer, Sitzungsber. Gesell. naturf. Freunde, Berlin, p. 182, July, type from pack ice off coast of eastern Greenland.

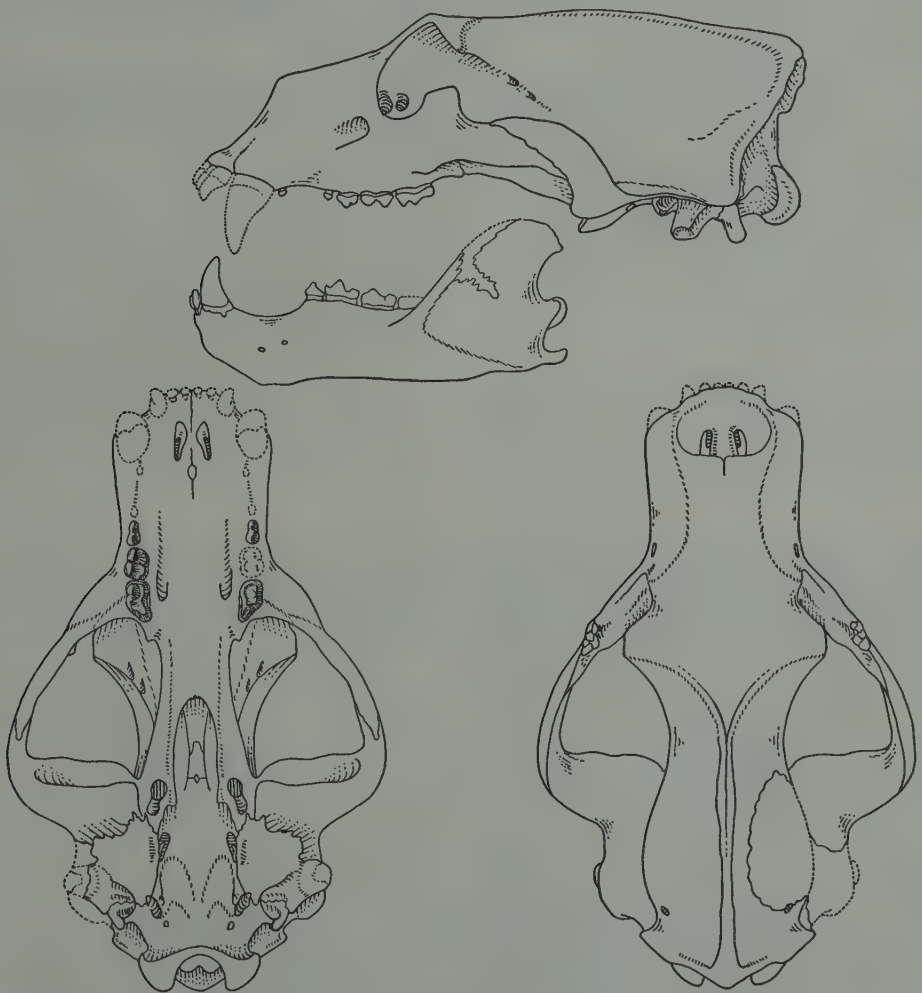


Fig. 476. *Thalarctos maritimus maritimus*, Birnirk Mounds, long. 156° 36′ 02″ W, lat. 71° 20′ 40″ N, 8 ft., Point Barrow, Alaska, No. 51982 K.U., probably ♂, lower jaw No. 51986 K.U., both ¼.

1912. *Thalarctos eogroenlandicus*, Miller, Bull. U.S. Nat. Mus., 79:77, December 31.

Thalarctos maritimus groenlandicus (Birula)

1932. *Thalassarctos maritimus groenlandicus* Birula, Trav. Inst. Acad. Zool. Sci., U.S.S.R., 1:11, 32, type from western Greenland.
1956. *Thalarctos maritimus groenlandicus*, Miller and Kellogg, Bull. U.S. Nat. Mus., 205:711, March 3.

Thalarctos maritimus labradorensis (Knottnerus-Meyer)

1908. *Th[alassarctos]. labradorensis* Knottnerus-Meyer, Sitzungsber. Gesell. naturf. Freunde, Berlin, p. 183, July, type from Okak, Labrador.

Thalarctos maritimus maritimus (Phipps)

1774. *Ursus maritimus* Phipps, A voyage toward the North Pole . . . , p. 185. Type locality, Spitzbergen. Occurs, according to Knottnerus-Meyer (see below), in West Greenland, Ellesmereland and Hudson Bay.
1862. *Thalarctos maritimus*, Gray, Catalogue of bones of Mammalia in the . . . British Museum, p. 105.
1908. ? *Thalassarctos jenaensis* Knottnerus-Meyer, Sitzungsber. Gesell. naturf. Freunde, Berlin, p. 184, July, type from Jena Island, Spitzbergen.
1908. ? *Th[alassarctos]. spitzbergensis* Knottnerus-Meyer, Sitzungsber. Gesell. naturf. Freunde, Berlin, p. 184, July, type from Seven Islands, Spitzbergen.

Thalarctos maritimus ungavensis (Knottnerus-Meyer)

1908. [*Thalassarctos maritimus*] var. *ungavensis* Knottnerus-Meyer, Sitzungsber. Gesell. naturf. Freunde, Berlin, p. 181, July, type from near Killinek, Ungava Bay, Quebec.
1912. *Thalarctos maritimus ungavensis*, Miller, Bull. U.S. Nat. Mus., 79:77, December 31.

FAMILY PROCYONIDAE—Raccoons and Allies

Genera revised by Hollister, Proc. U.S. Nat. Mus., 49: 143–150, August 13, 1915; and by Pocock, Proc. Zool. Soc. London, pp. 389–422, June 28, 1921.

Small to medium sized carnivores, usually with a long tail (short in the Asiatic *Ailuropoda* which may merit separate family status); feet plantigrade to semi-plantigrade and pentadactyl; alisphenoid canal absent (except *Ailurus*); claws non- or semi-retractile; carnassial teeth not sectorial (except *Bassariscus*); molars $\frac{2}{2}$ or $\frac{2}{3}$, low-crowned, broad, and multituberculate.

At one time or another each of the genera has been made the type of a monotypic family or subfamily. The following classification is conservative.

SUBFAMILY PROCYONINAE

Small carnivores; pentadactyl; plantigrade or semi-plantigrade; tail moderate to long, prehensile in *Potos*, annulated color pattern in some others; alisphenoid canal absent; digital, plantar, and carpal pads naked and well developed; baculum long, not upcurled apically, clavate at base, and not strongly keeled; no glandular area around anus; penis long, prepuce abdominal; anterior edge of coronoid inclined backwards.

KEY TO NORTH AMERICAN GENERA OF PROCYONINAE

1. Tail not annulated; digits webbed ⅓ length beyond plantar pad; baculum tipped with 4 condylelike branches; premolars $\frac{3}{3}$; mandible massive; palate parallel-sided. . . . . *Potos*, p. 893
1′. Tail annulated (except in *Bassaricyon*); digits not webbed or webbed more than ⅓ length beyond plantar pad; baculum not tipped with 4 condylelike branches; premolars $\frac{4}{4}$; mandible slender; palate arcuate.
   2. Molars and premolars with pointed or bladelike cusps; incisors with secondary lobes; canines rounded; tail long, long-haired, and annulated. . . . . *Bassariscus*, p. 879
   2′. Molars and premolars with heavy conical cusps; incisors without secondary lobes, or only I3 with secondary lobes; canines laterally compressed; tail short or long, short-haired or long-haired, and annulated or not (but no member combines long tail, long-haired tail and annulated tail).
      3. Rostrum greatly elongated and laterally compressed (see Fig. 481); P4 slightly longer than broad; M1 subquadrate, length and breadth about equal; claws long; snouth greatly elongated. *Nasua*, p. 891
      3′. Rostrum not greatly elongated and not laterally compressed (see Figs. 478–480); P4 as broad as long or broader; M1 variable; claws short; snout not greatly elongated.
         4. Tail not annulated, longer than head and body; mastoid small; claws short, sharp, and much curved; proximal ⅔ of digits webbed; P4 has three tubercules; malar ending at M2. *Bassaricyon*, p. 895
         4′. Tail annulated, shorter than head and body; mastoid large; claws long and blunt, not much curved; less than proximal half of digits webbed; P4 has five tubercules; malar ending at M1. *Procyon*, p. 883

Genus Bassariscus Coues—Ringtails

1830. *Bassaris* Lichtenstein, Abh. preuss. Akad. Wiss., Berlin, p. 119. Type, *Bassaris astuta* Lichtenstein. Not *Bassaris* Hubner, 1816.
1887. *Bassariscus* Coues, Science, 9:516, May 27, a renaming of *Bassaris* Lichtenstein. Type, *Bassaris astuta* Lichtenstein.
1886. *Wagneria* Jentink, Notes Leyden Mus., 8:129. Type, *Bassaris sumichrasti* Saussure. Not *Wagneria* Robineau-Desvoidy, 1830, or Alenitzin, 1873.
1904. *Jentinkia* Trouessart, Catalogus mammalium . . . , Suppl., fasc. 1, p. 184, a renaming of *Wagneria* Jentink.

Body elongate; tail longer than body, distinctly annulated; muzzle moderately elongate; ears relatively long, with well-developed bursa; feet with 5 toes, claws semi-retractile; baculum with rounded apex.

Skull elongate; postorbital processes well developed from frontal, moderately from zygomata; temporal crests uniting, if at all, only posteriorly to form sagittal crest; palate ending about posterior plane of M2; auditory bullae moderately inflated; P1–P3 unicusped; P4 sectorial with well-developed blade; deuterocone present posterior to protocone of P4; M1 variable, subquadrate to triangular, broader than long; canines doglike, smooth, slightly curved, not sculptured.

KEY TO SPECIES OF BASSARISCUS

1. Ears pointed; muzzle and feet blackish; 2nd to 5th digits of fore- and hind-limbs naked on lower surface behind digital pads; claws long, curved, compressed, and non-retractile; low ridges connecting cusps in molariform teeth; upper carnassial triangular; deuterocone lacking; I1 and I2 trifid.
B. sumichrasti, p. 882
1′. Ears rounded; muzzle and feet grayish; 2nd to 5th digits of fore- and hind-limbs densely hairy on lower surface behind digital pads; claws short, straight, not much compressed, retractile; high, sharp ridges connecting cusps in molariform teeth; upper carnassial irregular in outline, deuterocone present; I1 and I2 not lobed. . . . *B. astutus*, p. 879

Bassariscus astutus
Ringtail

External measurements: 616–811; 310–438; 57–78; 44–50. Weight, 870–1100 grams. Basilar length, 68.5–75.0; zygomatic breadth, 48.0–52.0; mastoid breadth, 33.4–35.4. Upper parts light buff to pinkish buff, overcast with black or dark brownish overhairs; underparts white or white washed with pale buff; eye ringed black or dark brown; supraorbital, suborbital, and subauricular patches white to pinkish buff; annulations distinct for full length of tail; margins of ears somewhat produced anteroexternally; feet with 5 toes, 2nd, 3rd, 4th, and 5th digits of fore- and hind-limbs densely haired on lower surface behind and around digital pads; claws short, straight, semi-retractile; posterior border of maxillary portion of zygoma lying at plane of M1; foramen ovale opening somewhat downward; cusps in larger molariform teeth with high connecting ridges; upper carnassial irregular in outline, with prominent deuterocone; cutting edges of I1 and I2 normally smooth.

Ringtails inhabit rocky, broken hillsides in chaparral. They are good climbers, but are not so arboreal as *B. sumichrasti*. They are omnivores; plants, mammals, birds, and invertebrates make up the diet. Three or 4 young are born in May or June.

Bassariscus astutus astutus (Lichtenstein)

1830. *B[assaris]. astuta* Lichtenstein, Abh. preuss. Akad. Wiss., Berlin, 1827, p. 119, type from near city of Mexico.
1887. *Bassariscus astutus*, Coues, Science, 9:516, May 27.
1904. *Bassariscus albipes* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):258, January 7, type from Xico, near Jalapa, Veracruz.

MARGINAL RECORDS.—San Luis Potosí (Dalquest, 1953b:185): 7 km. SE Presa de Guadalupe; 6 km. NE Ciudad del Maíz; Hacienda Capulín. Veracruz: Acatlán, 4100 ft. (32205 KU); *Xico* (Elliot, 1904:258); Orizaba (J. A. Allen, 1879:338). Puebla: Río Otlati, 15 km. NW San Martín, 8700 ft. (Davis, 1944:381). Distrito Federal: ¼ mi. E San Gregorio Atlapulco, 2260 m. (28021 KU). San Luis Potosí: Bledos (Dalquest, 1953b:185).

Bassariscus astutus arizonensis Goldman

1932. *Bassariscus astutus arizonensis* Goldman, Proc. Biol. Soc. Washington, 45:87, June 21, type from Cosper Ranch, about 12 mi. south of Blue, 5000 ft., Greenlee Co., Arizona.

MARGINAL RECORDS.—Utah (Durrant, 1952:413): Dry Fork, 12 mi. NW Vernal; Bitter Creek, 16 mi. SW Dragon. Arizona: type locality. New Mexico: Redrock (Goldman, 1932b:88). Arizona: Santa Rita Mts. (*ibid.*); 5 mi. N Wickenburg (Hatfield, 1942:148); mouth of Diamond Creek, Colorado River (Goldman, 1932b:88). Utah (Durrant, 1952:413): Rainbow Lodge; Willow Creek, 42 mi. S Ouray.

Fig. 477. *Bassariscus astutus nevadensis,* 10 mi. S Caliente, Nevada, No. 51665 M.V.Z., ♂, X 1.

Bassariscus astutus bolei Goldman

1945. *Bassariscus astutus bolei* Goldman, Proc. Biol. Soc. Washington, 58:105, July 18, type from Chilpancingo, Guerrero.

MARGINAL RECORDS.—Guerrero: type locality. Oaxaca: Tenango (Goodwin, 1956a:11).

Bassariscus astutus consitus Nelson and Goldman

1932. *Bassariscus astutus consitus* Nelson and Goldman, Jour. Washington Acad. Sci., 22:497, October 19, type from La Salada, 40 mi. S Uruapan, Michoacán.

MARGINAL RECORDS.—Chihuahua: Mojarachic (Knobloch, 1942:297). Sinaloa: Plomosas (Nelson and Goldman, 1932:488). Jalisco: Bolaños (*ibid.*); 3 mi. N Guadalajara (30792 KU); Ocotlán (Nelson and Goldman, 1932: 488). Michoacán: 3 mi. NW Pátzcuaro, 6700 ft. (Hall and Villa, 1950:177); type locality, thence northward to point of beginning.

Bassariscus astutus flavus Rhoads

1894. *Bassariscus astutus flavus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 45:417, January 30, type from Texas, exact locality unknown.

MARGINAL RECORDS.—Colorado: 4 mi. E, 1 mi. N Rangeley, 5500 ft. (29123 KU); Glen-Mar Ranch, 25 mi. S Hot Sulphur Springs, 8800 ft. (Rutherford, 1954:443); Delta (Warren, 1942:49); Tabeguache, N of San Miguel (Cary, 1911:193). New Mexico: vicinity of Cimarron (Hill, 1942:77). Texas: "*Red River*" (V. Bailey, 1905:182); about 7 mi. E Beaumont (Blair, 1949:202). Nuevo León: Potrero Prieto (58651 KU). Tamaulipas: La Joya de Salas (Goodwin, 1954:15). Nuevo León: 7 mi. S Aramberri (58648 KU). Coahuila: Sierra Encarnación (79593 BS); 3 mi. SE Torreón, 3800 ft. (40771 KU). Texas: 1 mi. SW Boquillas (Borell and Bryant, 1942:14); Ridge N of The Bowl, 8300 ft. (Davis, 1940:75). New Mexico: Sacramento Mts. (V. Bailey, 1932:346); Black Range (*ibid.*); Mogollon Mts. (*ibid.*). Colorado: Mancos Canyon (Cary, 1911:193); Sunrise Copper Mine, W Paradox Valley (*ibid.*); 2½ mi. SW Mack, 4400 ft. (29124 KU). Seton, 1929(2):275, mentions records from Louisiana and Alabama. J. A. Allen, 1875:45, reports the species from Kansas. Bole and Moulthrop, 1942: 120–121, present information indicating the presence of *Bassariscus astutus* ssp. in Ohio in the 19th Century.

Bassariscus astutus insulicola Nelson and Goldman

1909. *Bassariscus astutus insulicola* Nelson and Goldman, Proc. Biol. Soc. Washington, 22:26, March 10, type from San José Island, Gulf of California, Baja California. Known only from the type locality.

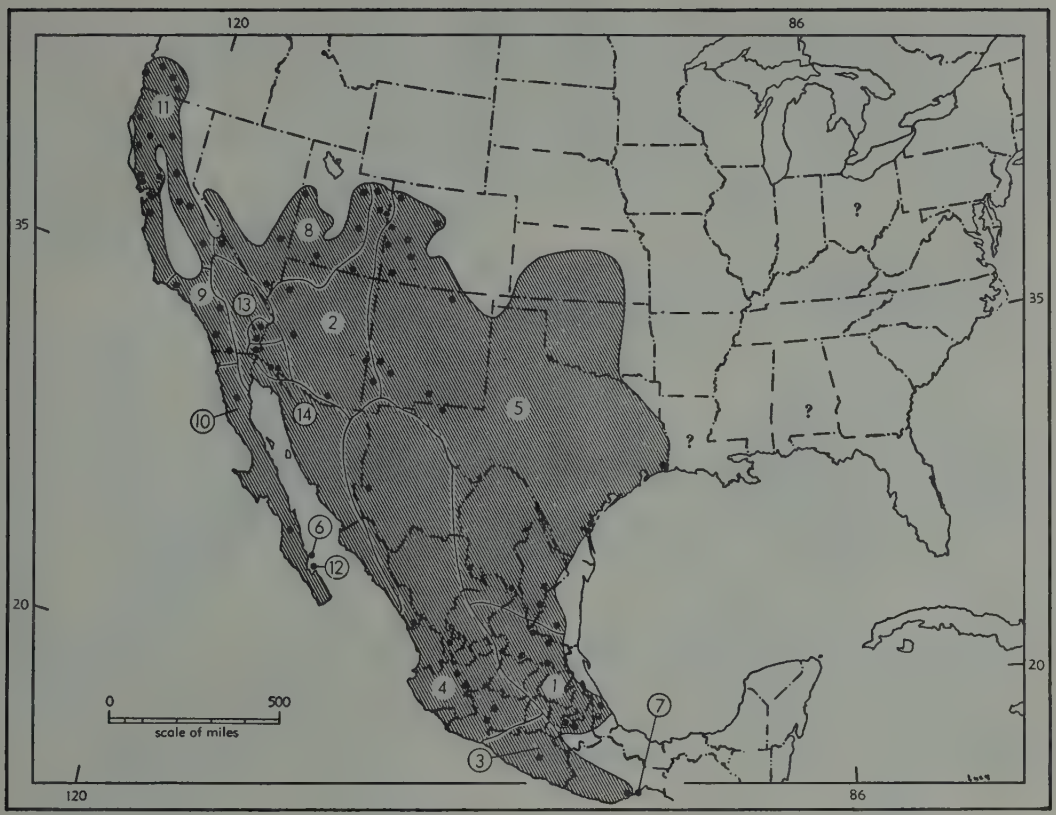
Bassariscus astutus macdougalli Goodwin

1956. *Bassariscus astutus macdougalli* Goodwin, Amer. Mus. Novit., 1757:10, March 8, type from La Ventosa, Salina Cruz, coastal lowlands, 20 km. S Tehuantepec, Oaxaca. Known only from the type locality.

Bassariscus astutus nevadensis Miller

1913. *Bassariscus astutus nevadensis* Miller, Proc. Biol. Soc. Washington, 26:159, June 30, type from El Dorado Canyon, Clark Co., Nevada.

MARGINAL RECORDS.—Utah (Durrant, 1952:413): near Mountain Home; Sinbad, approximately 50 mi. SW Greenriver; 12 mi. SW Orderville. Arizona: *Grand Canyon* (V. Bailey, 1935:33). Nevada: type locality. California: Union Mine, 4000 ft., W slope Inyo Mts. (Grinnell, *et al.*,



Map 454. *Bassariscus astutus.*

Guide to subspecies

1. *B. a. astutus*
2. *B. a. arizonensis*
3. *B. a. bolei*
4. *B. a. consitus*
5. *B. a. flavus*
6. *B. a. insulicola*
7. *B. a. macdougalli*
8. *B. a. nevadensis*
9. *B. a. octavus*
10. *B. a. palmarius*
11. *B. a. raptor*
12. *B. a. saxicola*
13. *B. a. willetti*
14. *B. a. yumanensis*

1937:171). Nevada: Meadow Valley Wash, 7 mi. S Caliente (Hall, 1946:183). Utah: Birch Creek Canyon, Deep Creek Mts., 6000 ft. (Durrant, 1952:413).

Bassariscus astutus octavus Hall

1926. *Bassariscus astutus octavus* Hall, Univ. California Publ. Zool., 30:39, September 8, type from San Luis River, 1700 ft., near Escondido, San Diego Co., California.

MARGINAL RECORDS.—California: Matilija (Hall, 1926:41); Mill Creek Cañon (*ibid.*); Jacumba (Grinnell, 1933:100); type locality.

Bassariscus astutus palmarius Nelson and Goldman

1909. *Bassariscus astutus palmarius* Nelson and Goldman, Proc. Biol. Soc. Washington, 22:26, March 10, type from Comondú, Baja California.

MARGINAL RECORDS.—Baja California: Concepción, lat. 31°, 6000 ft., Sierra San Pedro Mártir (Hall, 1926: 45); type locality.

Bassariscus astutus raptor (Baird)

1859. *Bassaris raptor* Baird, Mammals of the boundary, *in* Emory, Rept. U.S. and Mexican boundary survey . . . , 2(2):19, January, type from Glen Ellen, Sonoma Co., California (by restriction, Hall, Univ. California Publ. Zool, 30:44, September 8, 1926). The type specimen was caught in the city of Washington, D.C., where it had escaped from captivity.

1913. *Bassariscus astutus raptor*, Grinnell, Proc. California Acad. Sci., ser. 4, 3:289, August 28.

1894. *Bassariscus flavus oregonus* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 45:416, January 30, type from Grant's Pass, Josephine Co., Oregon.

MARGINAL RECORDS.—Oregon (V. Bailey, 1936:318): Riddle, Umpqua Valley; Prospect; W side Upper Klamath Lake. California (Grinnell, *et al.*, 1937:170, unless otherwise noted): Battle Creek; near Colfax; Yosemite; Tulare County (Grinnell, 1933:99); 6 mi. S Hetch Hetchy; Low Gap (Huey, 1937:359); 3 mi. NE Colusa (Naylor and Wilson, 1956:231); Salina (Fisher, 1933:257); Eldridge (Huey, 1937:359); Diamond Canyon near Fruitvale; Santa Rosa; Laytonville; 10 mi. NE Carlotta. Oregon: Gold Beach (V. Bailey, 1936:318).

Bassariscus astutus saxicola Merriam

1897. *Bassariscus saxicola* Merriam, Proc. Biol. Soc. Washington, 11:185, July 1, type from Espíritu Santo Island, Gulf of California, Baja California. Known only from the type locality.

1926. *Bassariscus astutus saxicola*, Hall, Univ. California Publ. Zool., 30:46, September 8.

Bassariscus astutus willetti Stager

1950. *Bassariscus astutus willetti* Stager, Proc. Biol. Soc. Washington, 63:203, December 29, type from Riverside Mountains, Riverside Co., California.

MARGINAL RECORDS.—California: type locality; Palo Verde Mts. (Stager, 1950:204).

Bassariscus astutus yumanensis Huey

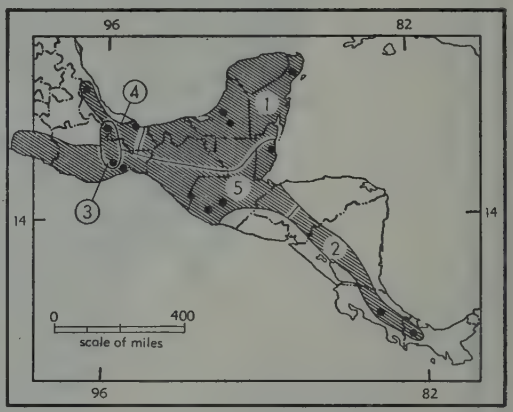
1937. *Bassariscus astutus yumanensis* Huey, Trans. San Diego Soc. Nat. Hist., 8:357, June 15, type from Tinajas Altas, Gila Mts., Yuma Co., Arizona.

MARGINAL RECORDS.—California: Laguna Dam, Imperial Co. (Huey, 1937:359). Arizona: Cabeza Prieta Game Range (Halloran, 1947:65; probably this subspecies); type locality.

Bassariscus sumichrasti
Cacomistle

External measurements: 790–1003; 396–508; 82–90; 44–45. Greatest length of skull, 82.9–90; basilar length, 74.2–79.5; zygomatic breadth, 49–57.5. General appearance as described for *B. astuta*, but with muzzle and feet blackish instead of grayish; annulations of tail becoming obsolescent distally; pelage soft and lax; ears evenly rounded; 2nd, 3rd, 4th, and 5th digits of fore- and hind-limbs naked on lower surface behind digital pads; claws long, strongly curved, non-retractile; posterior border of maxillary portion of zygoma at plane of M2; foramen ovale opening forward; cusps of larger molariform teeth with low connecting ridges; upper carnassial triangular; deuterocone lacking; cutting edges of I1 and I2 trifid.

Cacomistles are nocturnal and, for the most part, arboreal. They feed largely on rats, mice, and birds, and probably supplement their diet with fruit, insects, and vegetable-matter. They breed in January and litter-size varies from 2–4.



Map 455. *Bassariscus sumichrasti.*

Guide to subspecies
1. *B. s. campechensis*
2. *B. s. notinus*
3. *B. s. oaxacensis*
4. *B. s. sumichrasti*
5. *B. s. variabilis*

Bassariscus sumichrasti campechensis (Nelson and Goldman)

1932. *Jentinkia sumichrasti campechensis* Nelson and Goldman, Jour. Washington Acad. Sci., 22:486, October 19, type from Apazote, near Yohaltún, Campeche.

MARGINAL RECORDS.—Quintana Roo: Nabalam (Gaumer, 1917:209, as *B. sumichrasti*). Campeche: La Tuxpeña; type locality.

Bassariscus sumichrasti notinus Thomas

1903. *Bassariscus sumichrasti notinus* Thomas, Ann. Mag. Nat. Hist., ser. 7, 11:379, April, type from Boquete, 6000 ft., Chiriquí, Panamá.

MARGINAL RECORDS.—Costa Rica: Escazú (Goodwin, 1946:431). Panamá: type locality.

Bassariscus sumichrasti oaxacensis (Goodwin)

1956. *Jentinkia sumichrasti oaxacensis* Goodwin, Amer. Mus. Novit., 1757:11, March 8, type from La Gloria, 10 km. SE Santa María, Oaxaca.

MARGINAL RECORDS (Goodwin, 1956a:11–13).—Oaxaca: type locality; *Guiengola; Tres Cruces*; Tenango.

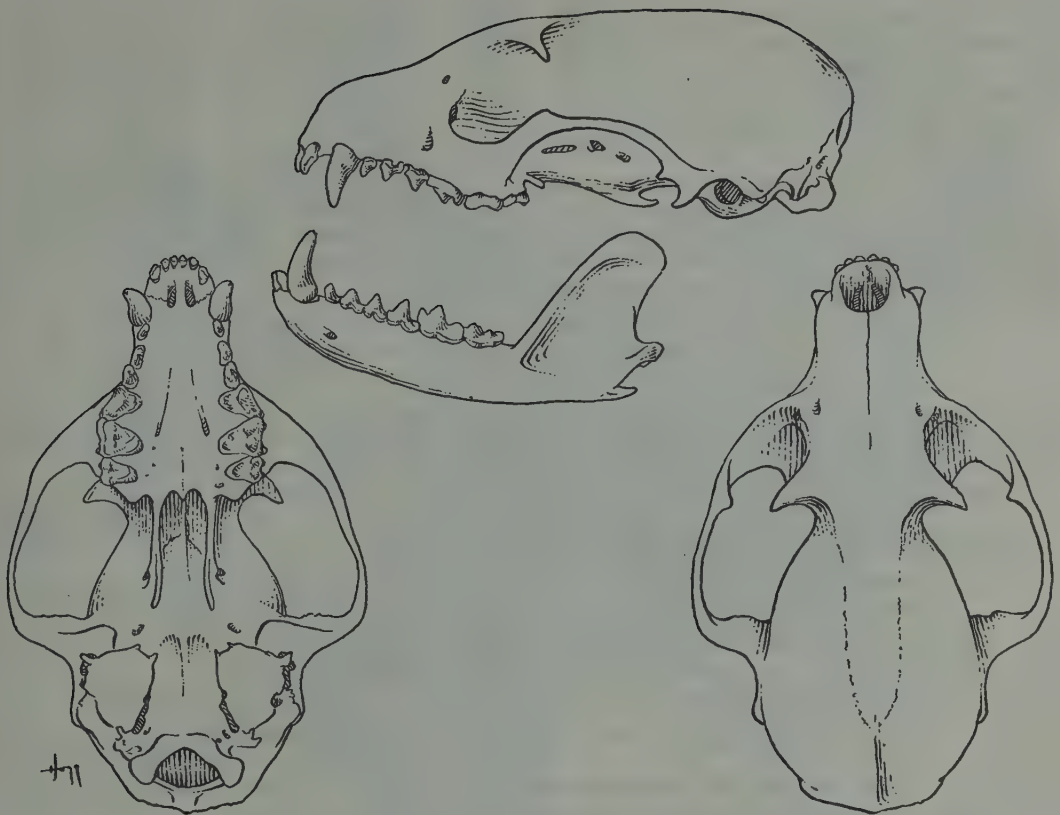


Fig. 478. *Bassariscus sumichrasti sumichrasti*, Mirador, Veracruz, No. 7082/8632 U.S.N.M., ♀, X 1.

Bassariscus sumichrasti sumichrasti (Saussure)

1860. *Bassaris sumichrasti* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:7, January. Type locality, Mirador, Veracruz.
1903. *Bassariscus sumichrasti*, Thomas, Ann. Mag. Nat. Hist., ser. 7, 11:379, April.
1875. *Bassaris monticola* Cordero, La Naturaleza, 3:270. Type probably from vicinity of Jalapa, Veracruz.

MARGINAL RECORDS.—Veracruz: Jalapa (J. A. Allen, 1879:340); type locality.

Bassariscus sumichrasti variabilis (Peters)

1874. *Bassaris variabilis* Peters, Monatsb. preuss. Akad. Wiss., Berlin, p. 704, type from Cobán, Alta Verapaz, Guatemala.
1903. *Bassariscus sumichrasti variabilis*, Thomas, Ann. Mag. Nat. Hist., ser. 7, 11:379, April.

MARGINAL RECORDS.—British Honduras: Silkgrass (Hershkovitz, 1951:561). Guatemala: near Joyabaj (Goodwin, 1934:19); Salache (*op. cit.*, p. 18). Chiapas: W. slope Volcán de Tacaná, 2800 m. (Hooper, 1947:44). Oaxaca: Tehuantepec (J. A. Allen, 1879:339, as *B. sumichrasti*).

Genus Procyon Storr—Raccoons

North American forms revised by Goldman, N. Amer. Fauna, 60:vi + 153, 22 pls., 2 figs., 1950.

1780. *Procyon* Storr, Prodromus methodi mammalium . . . , p. 35. Type, *Ursus lotor* Linnaeus.

Head broad behind, with pointed muzzle; ears medium-sized, pointed; toes not webbed; claws non-retractile; soles of feet naked; tail shorter than body, annulated, and not prehensile; baculum long and slender, bilobed anteriorly; mammae: p. 2, a. 2, i. 2.

Skull elongate; braincase broad and flat with medium interorbital constriction; zygomata with distinct postorbital processes; frontal processes greatly reduced; sagittal crest moderate or absent; palate flat or slightly concave, extending consider-

ably beyond plane of last molars; vomer attached to palatal bones; foramen ovale small; postglenoid process small; audital bullae large, much inflated on inner side, and not rising at sharp angle above tube of external auditory meatus; mandible long; ascending ramus low and without highly arched curve; condyles small.

Teeth large, maxillary tooth-row about ⅓ greatest length of skull; molariform teeth with heavy, conical cusps; P4 and M1 subquadrate, only slightly broader than long or as broad as long; P4 subsectorial; incisors heavy; canines ovate at alveolus, slightly grooved on edges of outer surface and flattened on inner surface; P1 with a single root; P2 and P3 with 2 roots; P4 with 3 roots; P3 unicuspid with well-developed cingulum; P4 with 5th tubercle; m1 large, with 5 heavy conical cusps. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{2}{2}$.

Raccoons are omnivorous, nocturnal, good climbers, and are usually found near water. They breed late in winter. A litter of 1 to 6 (av. 3.5) young is born after a gestation period of about 63 days. Females may breed at 1 year of age; males breed in their 2nd year.

KEY TO SUBGENERA AND SPECIES OF PROCYON
(after Goldman, 1950)

1. Pelage coarse and wiry, without underfur; hair on nape directed forward; palate extending behind posterior molars a distance of less than ¼ length of palate. . . (subgenus *Euprocyon*) *P. cancrivorus*, p. 890
1′. Pelage of two kinds, long guard hairs and short, soft underfur; hair on nape normal, not directed forward; palate extending behind posterior molars a distance of more than ¼ length of palate. (subgenus *Procyon*)
2. Geographic range on continental North America. . . . . *P. lotor*, p. 884
2′. Geographic range insular (at least in part).
3. Geographic range off Pacific Coast.
4. Found on Vancouver Island. . . . . *P. lotor*, p. 884
4′. Found on Tres Marías Islands. . . . . *P. insularis*, p. 889
3′. Geographic range off Atlantic Coast (at least in part).
5. Geographic range far offshore islands (Bahamas and Lesser Antilles).
6. Found on Bahama Islands (New Providence Island). . . . . *P. maynardi*, p. 889
6′. Found on Lesser Antilles.
7. Color darker; upper carnassial longer than broad; found on Barbados Island. *P. gloveralleni*, p. 890
7′. Color paler; upper carnassial shorter than broad; found on Guadeloupe Island. *P. minor*, p. 890
5′. Geographic range coastal islands (at least in part).
8. Size small; hind foot 90 or less; found on Cozumel Island off coast of Yucatan. *P. pygmaeus*, p. 889
8′. Size larger; hind foot more than 90; found on southern Florida Keys and islands and coasts of Georgia and South Carolina. . . . . *P. lotor*, p. 884

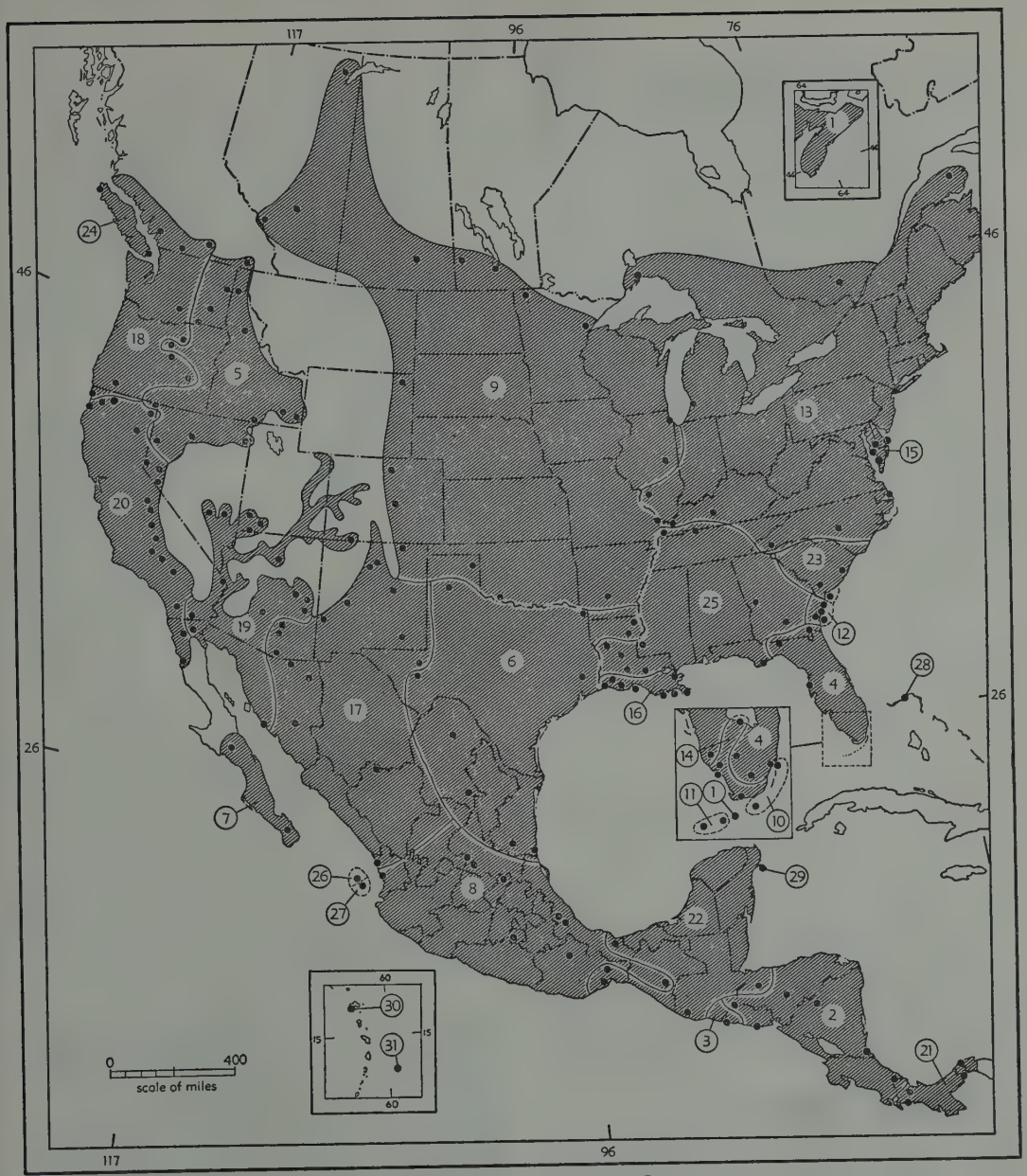
Subgenus **Procyon** Storr

1780. *Procyon* Storr, Prodromus methodi mammalium . . . , p. 35. Type, *Ursus lotor* Linnaeus.
1795. *Campsiurus* Link, Beyträge zur Naturgeschichte, 1(2):87. Based on three species, including *Ursus lotor* Linnaeus.
1795. *Lotor* É. Geoffroy St.-Hilaire and G. Cuvier, Mag. Encyclopédique, 2:187. Based on the Raton [= *Ursus lotor* Linnaeus] of North America.

Pelage long, hair of neck not directed forward; claws sharp and curved; baculum strongly bowed and recurved at distal end; palate extending backward beyond plane of last molars a distance greater than ¼ entire length of palate, usually nearly ⅓; posterior part of I3 usually with an independent cusp; upper molariform teeth with sharp, coniform cusps; M1 quadrituberculate and no accessory cusplet in cingulum.

Procyon lotor
Raccoon

External measurements: (males) 634–950; 200–405; 96–138; (females) 603–909; 192–340; 83–129. Weights range from 1.8 to 22.2 kg. Greatest length of skull: ♂ 99.9–136.5, ♀ 93.6–122.5; condylobasal



Map 456. Raccoons of the subgenus *Procyon*.

Guide
to kinds

1. *P. lotor auspicatus*
2. *P. lotor crassidens*
3. *P. lotor dickeyi*
4. *P. lotor elucus*
5. *P. lotor excelsus*
6. *P. lotor fuscipes*
7. *P. lotor grinnelli*
8. *P. lotor hernandezii*
9. *P. lotor hirtus*
10. *P. lotor inesperatus*
11. *P. lotor incautus*
12. *P. lotor litoreus*
13. *P. lotor lotor*
14. *P. lotor marinus*
15. *P. lotor maritimus*
16. *P. lotor megalodous*
17. *P. lotor mexicanus*
18. *P. lotor pacificus*
19. *P. lotor pallidus*
20. *P. lotor psora*
21. *P. lotor pumilus*
22. *P. lotor shufeldti*
23. *P. lotor solutus*
24. *P. lotor vancouverensis*
25. *P. lotor varius*
26. *P. insularis insularis*
27. *P. insularis vicinus*
28. *P. maynardi*
29. *P. pygmaeus*
30. *P. minor*
31. *P. gloveralleni*

length, 94.3–125.8, 89.4–115.9; zygomatic breadth, 60.2–89.1, 58.3–81.2; alveolar length of maxillary tooth-row, 36.4–47.4, 35.0–45.7. Upper parts iron gray to blackish, more or less suffused with buff, rusty, or "orange rufous," especially on nape; top of head grizzled; face with sharply delimited black mask usually reaching from cheeks across eyes and muzzle, with median extensions downward to rhinarium and upward on forehead, but more or less interrupted between eyes, in some subspecies; facial mask bordered by conspicuous white lines extending from near middle of forehead backward under ears or to sides of neck; sides of muzzle, lips and chin white; underparts thinly overlaid with long grayish or buffy overhairs, only partly concealing dense brownish underfur; throat crossed by distinct blackish or brownish area, separated from facial mask by narrow white lines extending posteriorly from muzzle; ears clothed with short grayish or buffy hairs, with black areas varying in size and distinctness at posterior base; forearms and thighs similar to underparts, but hind legs blackish near heels; forefeet whitish; hind feet usually whitish, but dusky of ankles sometimes extending down on metatarsus; tail above with 5 to 7 conspicuous black rings and a black tip, alternating with broader grayish or buffy rings, the black rings less sharply defined and sometimes interrupted below (after Goldman, 1950:32).

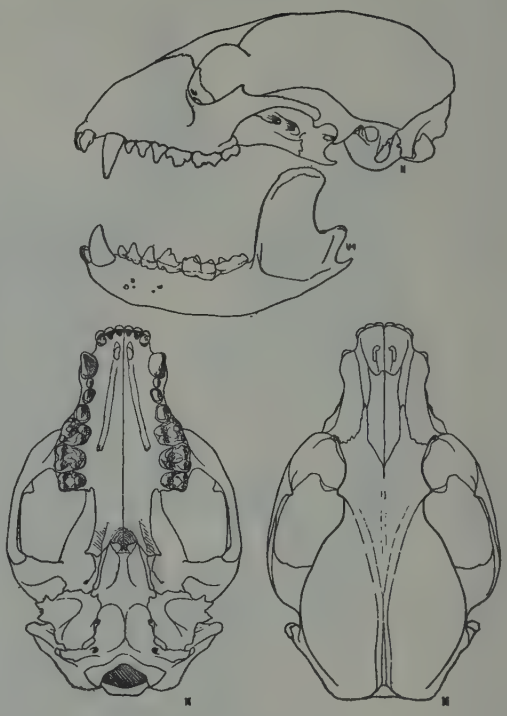


Fig. 479. *Procyon lotor psora*, S end Marlette Lake, Ormsby Co., Nevada, No. 70003 M.V.Z., ♀, X ¾.

Procyon lotor auspicatus Nelson

1930. *Procyon lotor auspicatus* Nelson, Smiths. Miscl. Coll., 82(8):9, July 10, type from Marathon, Key Vaca, Monroe Co., Florida. Known only from type locality.

Procyon lotor crassidens Hollister

1914. *Procyon lotor crassidens* Hollister, Proc. Biol. Soc. Washington, 27:142, July 10, type from Talamanca, Limón, Costa Rica.

MARGINAL RECORDS (Goldman, 1950:70, unless otherwise noted).—Honduras: La Flor Archaga (Goodwin, 1942:176). Nicaragua: Jalapa; San Rafael del Norte. Costa Rica: type locality. El Salvador: Puerto del Triunfo; Lake Guija.

Procyon lotor dickeyi Nelson and Goldman

1931. *Procyon lotor dickeyi* Nelson and Goldman, Proc. Biol. Soc. Washington, 44:18, February 21, type from Barra de Santiago, Ahuachapán, El Salvador.

MARGINAL RECORDS (Goldman, 1950:69).—*Guatemala.* El Salvador: type locality.

Procyon lotor elucus Bangs

1898. *Procyon lotor elucus* Bangs, Proc. Boston Soc. Nat. Hist., 28:219, March, type from Oak Lodge, East Peninsula opposite Micco, Brevard Co., Florida.

MARGINAL RECORDS (Goldman, 1950:44, unless otherwise noted).—Georgia: Okefenokee Swamp, thence along east coast of Florida to: Black Point; 15 mi. W Royal Palm State Park, 10 mi. E Pine Crest (Sherman, 1937:110); Lake Norris (*ibid.*); Royal Palm Hammock, thence northward along coast to Aucilla River. Introduced on Grand Bahama, Bahama Islands (Sherman, 1954:126).

Procyon lotor excelsus Nelson and Goldman

1930. *Procyon lotor excelsus* Nelson and Goldman, Jour. Mamm., 11:458, November 11, type from Owyhee River (near mouth of North Fork), Malheur Co., Oregon, 10 mi. W Fairylawn, Owyhee Co., Idaho.

MARGINAL RECORDS (Goldman, 1950:61, unless otherwise noted).—British Columbia: Kootenay Flats near Wynndel (Munro, 1950:80, recorded as *P. lotor*, and provisionally referred here to *excelsus* pending acquisition of specimens for study). Idaho: a few mi. W Spirit Lake (Rust, 1946:314); upper Middlefork River (Orr, 1943:521); Preuss Mts.; Junction Ross Fork Creek and Portneuf River, Bannock Co. (Davis, 1939:128); Goose Creek, 25 mi. SW Oakley (*ibid.*). Nevada: Montello; near Golconda; 14½ mi. E Hausen (Hall, 1946:178). California: Parker Creek. Oregon: Tupper. Washington: Wallula; Washtucna; Little Spokane River, 15 mi. W Idaho State line (Rust, 1946:313).

Procyon lotor fuscipes Mearns

1914. *Procyon lotor fuscipes* Mearns, Proc. Biol. Soc. Washington, 27:63, March 20, type from Las Moras Creek, 1011 ft., Fort Clark, Kinney Co., Texas.
1837. *Procyon nivea* Gray, Charlesworth's Mag. Nat. Hist., 1:580. Type locality, "Texas," may be referable to this subspecies.

MARGINAL RECORDS (Goldman, 1950:51, unless otherwise noted).—Texas: Canyon; 10 mi. NW Texarkana; Kountze. Tamaulipas: Alta Mira; Gómez Farías (Goodwin, 1954:14). Coahuila: ½ mi. W Chorro, 3 mi. S, 11 mi. E Saltillo (35708 KU); Múzquiz. Texas: *1 mi. N Fort Davis* (Blair, 1940:23); near Limpia Creek, 5 mi. N Fort Davis, 4700 ft. (*ibid.*).

Procyon lotor grinnelli Nelson and Goldman

1930. *Procyon lotor grinnelli* Nelson and Goldman, Jour. Washington Acad. Sci., 20:82, March 4, type from La Paz, Baja California.

MARGINAL RECORDS (Goldman, 1950:63).—Baja California: San Ignacio; Mt. Miraflores.

Procyon lotor hernandezii Wagler

1831. *Pr*[*ocyon*]. *hernandezii* Wagler, Isis von Oken, 24: 514, type from Tlalpam, Valley of México.
1890. *Procyon lotor hernandezi*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 3:176, December 10.
1910. *Pr*[*ocyon*]. *hernandezi castaneus* de Beaux, Zool. Anzeiger, 35:624, April 26, type from "Mexico."

MARGINAL RECORDS (Goldman, 1950:65, unless otherwise noted).—San Luis Potosí: Hacienda la Parada; San Luis Potosí. Querétaro: Jalpan. Veracruz: Jico; Mirador. Chiapas: near Comitán (Booth, 1957:16). Oaxaca: Cuicatlán. Morelos: Alpuyeca (Davis and Russell, 1954: 71). Nayarit: San Blas.

Procyon lotor hirtus Nelson and Goldman

1930. *Procyon lotor hirtus* Nelson and Goldman, Jour. Mamm., 11:455, November 11, type from Elk River, Sherburne Co., Minnesota.
1911. *Pr*[*ocyon*]. *hudsonicus* Brass, Aus dem Reiche der Pelze, p. 564, April. No type designated; may be referable to this subspecies.

MARGINAL RECORDS (Goldman, 1950:38, unless otherwise noted).—Alberta: Wood Buffalo Park (Rand, 1948b:76). Saskatchewan: Regina (Anderson, 1947:35). Manitoba: Fort Ellice (*ibid.*); near Delta (Sowls, 1949: 313). Minnesota: Roseau County (Swanson, *et al.*, 1945: 63); NE of Duluth (*ibid.*), thence along S shore of Lake Superior and W shore of Lake Michigan to Illinois: Jackson Park, Chicago; Champaign County (Necker and Hatfield, 1941:46). Arkansas: Clark County (Dellinger and Black, 1940:188). Oklahoma: 20 mi. from Frederick. Texas: Canadian. New Mexico: Bear Canyon, Raton Range. Colorado: near Monument (Warren, 1942:48, as *P. lotor*); Arkins. Wyoming: New Haven. Alberta: Banff (Anderson, 1947:35); Ponoka (*ibid.*).

Procyon lotor inesperatus Nelson

1930. *Procyon lotor inesperatus* Nelson, Smiths. Miscl. Coll., 82(8):8, July 10, type from Upper Matecumbe Key, Monroe Co., Florida.

MARGINAL RECORDS (Goldman, 1950:47).—Florida: Virginia Key; Lower Matecumbe Key.

Procyon lotor incautus Nelson

1930. *Procyon lotor incautus* Nelson, Smiths. Miscl. Coll., 82(8):10, July 10, type from Torch Key, Big Pine Key Group, Monroe Co., Florida.

MARGINAL RECORDS (Goldman, 1950:49).—Florida: Big Pine Key; Key West.

Procyon lotor litoreus Nelson and Goldman

1930. *Procyon lotor litoreus* Nelson and Goldman, Jour. Mamm., 11:457, November 11, type from Saint Simon Island, Glynn Co., Georgia.

MARGINAL RECORDS (Goldman, 1950:40).—Georgia: Thunderbolt Creek, Chatham Co.; Ossabaw Island; type locality; mouth Altamaha River, McIntosh Co.

Procyon lotor lotor (Linnaeus)

1758. [*Ursus*] *lotor* Linnaeus, Syst. nat., ed. 10, 1:48. Type locality, Pennsylvania (fixed by Thomas, Proc. Zool. Soc. London, p. 140, March, 1911).
1815. *Procyon lotor*, Illiger, Abh. preuss. Akad. Wiss., Berlin, 1804–1811, pp. 70, 74.
1808. *L*[*otor*]. *vulgaris* Tiedemann, Zoologie . . . , 1:280 (original not seen).
1814. *Procyon annulatus* G. Fischer, Zoognosia, 3:177. Type locality, "Americae maritimis."
1837. *Procyon obscurus* Wiegmann, Archiv. Naturgesch., 3(1):370. Type locality, "Patria ignota," may be referable to this subspecies.
1848. *Procyon gularis* Hamilton-Smith, The naturalist's library (edit. Jardine), 15:222. Type locality, state of New York.
1850. [*Procyon brachyurus*] var. *fusca* Burmeister, Verzeich. Zool. Mus. Univ. Halle-Wittenberg Säug. . . . , p. 13, may be referable to this subspecies.
1864. [*Procyon lotor*] var. *melanus* Gray, Proc. Zool. Soc. London, p. 704, may be referable to this subspecies.
1910. *Pr*[*ocyon*]. *lotor rufescens* de Beaux, Zool. Anzeiger, 35:625, April 26. Type locality, unknown. *P. l. rufescens* may be a synonym of *P. l. lotor*.

MARGINAL RECORDS (Goldman, 1950:36, unless otherwise noted).—Quebec: Madeline River, Gaspe (Anderson, 1939:51). *Nova Scotia*, thence southward to North Carolina: Coinjack; Moore County; Highlands. Kentucky: Mammoth Cave; Paducah. Illinois: Olive Branch; Belleville. Michigan: New Richmond. Ontario: Nipigon (Anderson, 1947:35). Quebec: Meach Lake (Rand, 1945c:118).

Procyon lotor marinus Nelson

1930. *Procyon lotor marinus* Nelson, Smiths. Miscl. Coll., 82(8):7, July 10, type from near Chokoloskee, Collier Co., Florida.

MARGINAL RECORDS (Goldman, 1950:45).—Florida: Ritta; Flamingo; Coon Key, Ten Thousand Islands; type locality.

Procyon lotor maritimus Dozier

1948. *Procyon lotor maritimus* Dozier, Jour. Mamm., 29: 286, August 31, type from Blackwater National Wildlife Refuge, Dorchester Co., Maryland.

MARGINAL RECORDS (Goldman, 1950:86).—Delaware: Rehoboth Bay. Virginia: Saxis Island. Maryland: Crocheron; *type locality*; Vienna.

Procyon lotor megalodous Lowery

1943. *Procyon lotor megalodous* Lowery, Occas. Papers Mus. Zool., Louisiana State Univ., 13:225, November 22, type from Marsh Island, Iberia Parish, Louisiana.

MARGINAL RECORDS (Goldman, 1950:85).—Louisiana: Toca Village; Delta National Wildlife Refuge, below Pilottown; Grand Terre Island; Timbalier Island; Marsh Island; Rockefeller Refuge; near Sabine Wildlife Refuge; Lake Charles.

Procyon lotor mexicanus Baird

1858. *Procyon hernandezii* var. *mexicana* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):215, July 14, type from Espía, Chihuahua.
1914. *Procyon lotor mexicanus*, Mearns, Proc. Biol. Soc. Washington, 27:65, March 20.
1855. *Procyon lotor*, varieté mexicaine I. Geoffroy St.-Hilaire, Voyage autour du monde sur la frégate la Vénus . . . , Zoologie, p. 125. Type locality, Mazatlán, Sinaloa. (Geoffroy St.-Hilaire's account not seen by us; Goldman, N. Amer. Fauna, 60:53, November 7, 1950, states that Geoffroy St.-Hilaire did not formally propose a name.)

MARGINAL RECORDS (Goldman, 1950:53–54, unless otherwise noted).—New Mexico: Rinconada; Santa Rosa; Carlsbad (V. Bailey, 1932:348). Texas: Pecos (V. Bailey, 1905:194). Durango: Rancho Santuario. Nayarit: Acaponeta. Sonora: Tecoripa (Burt, 1938:28); La Noria (*ibid.*). Arizona: McCleary's Ranch, Santa Rita Mts.; Fort Lowell; Santa Catalina Mts. New Mexico: Gila National Forest; Magdalena Mts.; Velarde.

Procyon lotor pacificus Merriam

1899. *Procyon psora pacifica* Merriam, N. Amer. Fauna, 16: 107, October 28, type from Lake Keechelus, 3000 ft., Kittitas Co., Washington.
1923. *Procyon lotor pacifica*, Grinnell, Univ. California Publ. Zool., 21:316, January 27.
1911. *Procyon proteus* Brass, Aus dem Reiche der Pelze, p. 564, April, type from West coast from Puget Sound to Cascade Mountains. Not J. A. Allen, 1904.

MARGINAL RECORDS (Goldman, 1950:59, unless otherwise noted).—British Columbia: Brackendale (Anderson, 1947:35); Chilliwack Valley (*ibid.*); Okanagan Falls (Cowan and Guiguet, 1956:298). Washington: Toppenish. Oregon: Hardman; Big Summit Prairie, Ochoco National Forest; Riverside; 32 mi. S Grants Pass. California: Crescent City, thence northward along coast to point of beginning.

Procyon lotor pallidus Merriam

1900. *Procyon pallidus* Merriam, Proc. Biol. Soc. Washington, 13:151, June 13, type from New River, about 6 mi. W Imperial, Imperial Co., California.
1923. *Procyon lotor pallidus*, Grinnell, Univ. California Publ. Zool., 21:316, January 27.
1914. *Procyon lotor ochraceus* Mearns, Proc. Biol. Soc. Washington, 27:64, March 20, type from Monument 172, Río Sonoyta, 1181 ft., Sonora, near Quitobaquito, Arizona.

MARGINAL RECORDS (Goldman, 1950:55, unless otherwise noted).—Utah: Pine Valley; Zion National Park (Durrant, 1952:414); St. George (*ibid.*). Colorado: Navajo River, Archuleta Co. Arizona: Wupatki National Monument; Phoenix; Lakeside; 3 mi. NE Springerville; 25 mi. SE Fort Apache. Sonora: Bahía San Pedro (Burt, 1938:29). Baja California: Cocopah Mts. California: New River, Colorado Desert; Colorado River, 5 mi. below Needles. Nevada: Pahranagat Valley, 2 mi. N Crystal Spring (Hall, 1946:179); 3 mi. S Tennille Ranch, 10 mi. S Caliente.

Procyon lotor psora Gray

1842. *Procyon psora* Gray, Ann. Mag. Nat. Hist., ser. 1, 10:261, December, type from Sacramento, Sacramento Co., California.
1923. *Procyon lotor psora*, Grinnell, Univ. California Publ. Zool., 21:316, January 27.
1914. *Procyon lotor californicus* Mearns, Proc. Biol. Soc. Washington, 27:66, March 20, type from ocean beach near Mexican boundary monument No. 258, San Diego Co., California.

MARGINAL RECORDS (Goldman, 1950:57–58, unless otherwise noted).—California: 5 mi. E Gazelle; Cassel; Spalding, Eagle Lake. Nevada (Hall, 1946:179): S end Marlette Lake; Walker River, 14 mi. N Yerington; E side Lake Tahoe. California: vicinity Yosemite Valley (Grinnell, 1933:98); Soquel Mill, 40 mi. E Raymond; Three Rivers; Kern River, 25 mi. above Kernville; Isabella; Mohave River; Oro Grande (Grinnell, 1933:98); Julian. Baja California: Laguna Hansen; San Quintín, thence northward along coast to California: Trinidad; Klamath River, Siskiyou Co.

Procyon lotor pumilus Miller

1911. *Procyon pumilus* Miller, Proc. Biol. Soc. Washington, 24:3, January 28, type from Ancón, Canal Zone, Panamá.
1920. *Procyon lotor pumilus*, Goldman, Smiths. Miscl. Coll., 69(5):151, April 26.

MARGINAL RECORDS (Goldman, 1950:71).—Panamá: Porto Bello; Balboa; Pedregal; Boquerón.

Procyon lotor shufeldti Nelson and Goldman

1931. *Procyon lotor shufeldti* Nelson and Goldman, Proc. Biol. Soc. Washington, 44:17, February 21, type from La Tuxpeña, Champotón, Campeche.

MARGINAL RECORDS (Goldman, 1950:67).—Veracruz: Minatitlán, thence along coast to Honduras: Santa Barbara. Guatemala: El Espino. Oaxaca: Huilotepec; San Mateo del Mar.

Procyon lotor solutus Nelson and Goldman

1931. *Procyon lotor solutus* Nelson and Goldman, Jour. Mamm., 12:308, August 24, type from Hilton Head Island, Beaufort Co., South Carolina.

MARGINAL RECORDS (Goldman, 1950:42).—South Carolina: Santee; type locality; Yemassee.

Procyon lotor vancouverensis Nelson and Goldman

1930. *Procyon lotor vancouverensis* Nelson and Goldman, Jour. Mamm., 11:458, November 11, type from Quatsino Sound, Vancouver Island, British Columbia.

MARGINAL RECORDS (Goldman, 1950:62, unless otherwise noted).—British Columbia, Vancouver Island: San Josef River Valley; Victoria. Introduced on Cox Island, Scott Island Group, British Columbia (Carl, *et al.*, 1951:B56).

Procyon lotor varius Nelson and Goldman

1930. *Procyon lotor varius* Nelson and Goldman, Jour. Mamm., 11:456, November 11, type from Castleberry, Conecuh Co., Alabama.

1910. *Pr*[*ocyon*]. *l*[*otor*]. *flavidus* de Beaux, Zool. Anzeiger, 35:626, April 26, type from "Southern United States," may be referable to this subspecies.

MARGINAL RECORDS (Goldman, 1950:39, unless otherwise noted).—Kentucky: Hickman. Tennessee: Clarksville. Georgia: Geneva; Nashville. Florida: Apalachicola. Louisiana: Plaquemine (Lowery, 1943:225); Morrow; Lafayette (Lowery, 1943:225); Provencal (*ibid.*). Mississippi: Washington.

Procyon insularis
Tres Marías Raccoon

External measurements (males): 840–904; 264–313; 128–135. Greatest length of skull, 119–121.8; condylobasal length, 114–115.2; zygomatic breadth, 82.5–86.4; alveolar length of maxillary tooth-row, 42.2–43.6. Pelage short and coarse, upper parts in general light cream buff, the dorsal area thinly overlaid with black; underparts thinly overlaid with pale creamy buff, the light brown underfur showing through; ears grayish, the black patches at posterior base, usual in the group, obsolescent; skull large, angular, and massive, with remarkably heavy zygomata; squamosal arm broad anteriorly and extended vertically; crown of second upper molar subquadrate, instead of subtriangular (after Goldman, 1950:72).

P. insularis is closely related to *P. lotor* of the mainland, but is regarded by Nelson and Goldman, 1931:20, as a full species.

Procyon insularis insularis Merriam

1898. *Procyon lotor insularis* Merriam, Proc. Biol. Soc. Washington, 12:17, January 27, type from María Madre Island, Tres Marías Islands, México. Known only from María Madre Island.

1931. *Procyon insularis insularis*, Nelson and Goldman, Proc. Biol. Soc. Washington, 44:20, February 21.

Procyon insularis vicinus Nelson and Goldman

1931. *Procyon insularis vicinus* Nelson and Goldman, Proc. Biol. Soc. Washington, 44:20, February 21, type from María Magdalena, Tres Marías Islands, México. Known only from María Magdalena Island.

Procyon maynardi Bangs
Bahaman Raccoon

1898. *Procyon maynardi* Bangs, Proc. Biol. Soc. Washington, 12:92, April 30, type from New Providence Island, Bahamas. Known only from the type locality.

External measurements of a male topotype: 713, 240, 100 (dry). Cranial measurements of a male and a female topotype, respectively: greatest length, 105.9, 103.5; condylobasal length, 101.7, 101; zygomatic breadth, 79.3, 64.6; alveolar length of maxillary tooth-row, 38.7, 38.9. Upper parts grayish, becoming ochraceous buffy on nape and over shoulders, moderately overlaid with black, thinning out along sides; underparts thinly overlaid with grayish (after Goldman, 1950:75).

The Bahama raccoon is closely related to those of the Florida Keys in form and proportions of skull. In external size it resembles *P. minor*, but differs in its paler color and narrower palatal shelf.

Procyon pygmaeus Merriam
Cozumel Island Raccoon

1901. *Procyon pygmaeus* Merriam, Proc. Biol. Soc. Washington, 14:101, July 19, type from Cozumel Island, Yucatán. Known only from the type locality.

External measurements of the type, a subadult male, and an adult female topotype, respectively, are: 667, 665; 230, 250; 90, 97. Cranial measurements of these same specimens: greatest length of skull, 100, 96.7; condylobasal length, 93.7, 91.9; zygomatic breadth, 58.8, 60.8; alveolar length of maxillary tooth-row, 35.3, 35.5. Upper parts light buffy gray; median dorsal area suffused with pale buff; underparts thinly overlaid with light buffy hairs but light brownish underfur showing through (after Goldman, 1950:77).

P. pygmaeus is the smallest species of the genus, and differs from its nearest relative, *P. lotor* of the mainland, in small size, small teeth, and presence of a diastema between the 2nd and 3rd upper premolars.

Procyon minor Miller
Guadeloupe Raccoon

1911. *Procyon minor* Miller, Proc. Biol. Soc. Washington, 24:4, January 28, type from Pointe-à-Pitre, Guadeloupe, Lesser Antilles, West Indies. Known only from Guadeloupe Island.

1837. *Procyon brachyurus* Wiegmann, Arch. Naturgesch., 3(1):369. Type locality, "Antillae?", may be referable to this species.

Cranial measurements of the type, a young male, and a subadult topotype, respectively: greatest length of skull, 101.6, 104.5; condylobasal length, 94.5, 98.5; zygomatic breadth, 55.3, 62; alveolar length of maxillary tooth-row, 38.5, 37.3. Upper parts grayish, becoming "ochraceous buff" on nape and shoulders; dorsum heavily overlaid with black, with usual grizzled effect; underparts thinly overlaid with grayish but light brown underfur showing through (after Goldman, 1950:78).

Procyon gloveralleni Nelson and Goldman
Barbados Raccoon

1930. *Procyon gloveralleni* Nelson and Goldman, Jour. Mamm., 11:453, November 11, type from Barbados, Lesser Antilles, West Indies. Known only from type locality.

Cranial measurements of the type, a young male, and an adult female topotype, respectively, are: greatest length of skull, 94, 113.2; condylobasal length, 89.2, ——; zygomatic breadth, 53.4, ——; alveolar length of maxillary tooth-row, 37, 40. Upper parts near light ochraceous buff (most intense on nape and shoulders) rather heavily overlaid with black; underparts thinly overlaid with buffy grayish (after Goldman, 1950:79).

The Barbados raccoon resembles *P. minor* and *P. maynardi*, but in some features shows relationships to the raccoons of Central America. Formerly abundant on the south side of Barbados, *P. gloveralleni* is now rare, and may be extinct.

Subgenus **Euprocyon** Gray

1865. *Euprocyon* Gray, Proc. Zool. Soc. London, for 1864, p. 704, May. Type, *Ursus cancrivorus* Cuvier.

Pelage short, underfur absent; hair on nape directed forward; claws broad and blunt; baculum slightly bowed and not sharply recurved at distal end; palate extending behind molars a distance less than ¼ total length of palate; upper molariform teeth (except first premolars) large and massive, with broad, round, blunt cusps, and with low connecting ridges; I3 with slightly developed cusp posteriorly; M1 5-tuberculate, with an additional accessory cusplet on posterior border of cingulum.

Procyon cancrivorus
Crab-eating Raccoon

External measurements of the type of *P. c. panamensis*, a male, are: 950, 350, 142. Greatest length of skull, 130; condylobasal length, 125.8; zygomatic breadth, 83.3; alveolar length of maxillary tooth-row, 48.3. Back ashy gray to ochraceous buff to yellowish ochraceous, becoming grayish white on throat, chin, and lips; tail with seven or eight black and grayish or yellowish rings and a black tip; proximal rings on tail more or less interrupted along ventral median line. For account of skull and teeth, see subgenus *Euprocyon*.

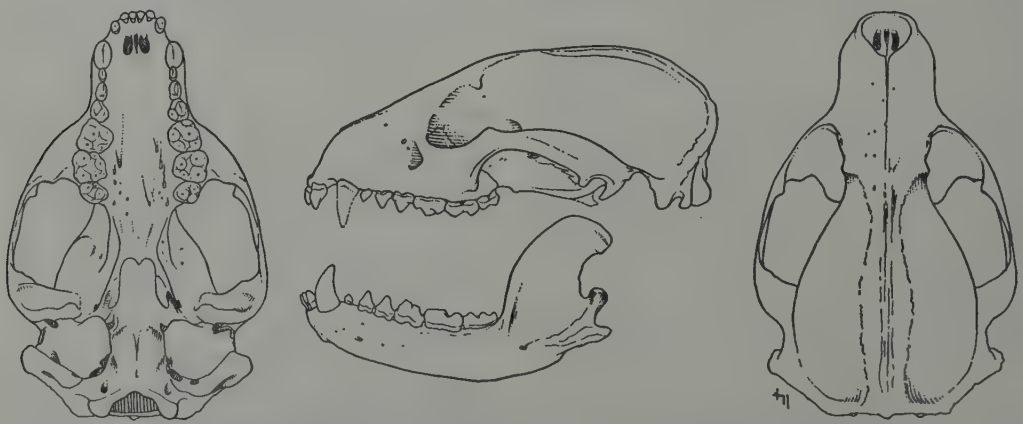
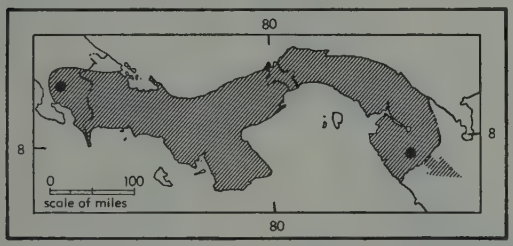


Fig. 480. *Procyon cancrivorus panamensis*, Gatún, Panamá, No. 171669 U.S.N.M., holotype, ♂, drawn from photographs, X approximately ⅓.

Procyon cancrivorus panamensis (Goldman)

1913. *Euprocyon cancrivorus panamensis* Goldman, Smiths. Miscl. Coll., 60(22):15, February 28, type from Gatún, Canal Zone, Panamá.
1920. *Procyon cancrivorus panamensis* Goldman, Smiths. Miscl. Coll., 69(5):152, April 24.

MARGINAL RECORDS (Goldman, 1950:83).—Costa Rica: Canas Gordo. Panamá: Cana.



Map 457. *Procyon cancrivorus panamensis.*

Genus Nasua Storr—Coatis

1780. *Nasua* Storr, Prodromus methodi mammalium . . . , p. 35, tab. A. Type, *Viverra nasua* Linnaeus.
1799. *Coati* Lacépède, Tableau des divisions . . . des mammifères, des cétacés et des oiseaux, p. 7. Based on several species, including *Viverra nasua* Linnaeus.
1872. *Cuati* Liais, Climats, Géol., Faune et Géog. Botanique, Brésil, p. 427, an accidental renaming of *Coati* Lacépède.

Head long, rostral portion elongated; snout upturned, mobile; ears short, rounded; tail longer than body, non-prehensile; soles of feet naked; toes united for some distance from bases; claws of forefeet long, slightly curved; claws of hindfeet strong, sharp, much curved.

Skull long and narrow; rostrum elongated and compressed laterally; interorbital constriction slight; sagittal crest well developed; palate flat or hollowed posteriorly, with distinct lateral grooves, and extending far beyond plane of last molars; palatine bones deeply notched on each side, with long processes extending laterally to the maxillary tuberosities; vomer usually attached to palatal bones; foramen ovale small; auditory bullae small, smoothly rounded, and rising at sharp angle from tube of external auditory meatus; ascending ramus of mandible relatively small and low.

Teeth of medium size; crowns comparatively high, with sharp, strong cusps; P4 longer than broad, nonsectorial; M1 subquadrate, length and breadth about equal, or longer than broad; I3 separated from I2 by diastema; lower incisors protruding forward; canines compressed laterally; premolars 2- or 3-rooted; P1–P3 each with single cusp; P4 with well-developed hypocone.

The coati is probably the most diurnal of the procyonids, being active by day as well as by night. It is omnivorous, eating chiefly fruits and berries. Coatis frequently hunt in groups, although some individuals travel alone, and natives regard the "solitarios" as a distinct form. They are adequate climbers and forage in the trees as well as on the ground. Four or 5 young are born in late spring or early summer after a gestation period of about 77 days. Recent evidence indicates that the coati may be extending its range northward, but escaped pets may account for some of the marginal records of occurrence. *Nasua* awaits adequate revision.

Key to North American Species of Nasua

1. Total length less than 800; length of tail less than 400; hind foot less than 90; found only on Cozumel Island, Quintana Roo. *N. nelsoni*, p. 893
1′. Total length more than 800; length of tail more than 400; hind foot more than 90; found on mainland. . . . . *N. narica*, p. 891

Nasua narica
Coati

External measurements (males): 850–1340; 420–680; 95–122. Greatest length of skull, 107.2–136.2; condylobasal length, 100.8–128.9; zygomatic breadth, 50.8–74.6. Upper parts pale brown to reddish, often overlaid with yellow; neck and shoulders yellowish; eyes masked with pale umber to brown; muzzle, chin, and throat whitish; thin whitish streaks extending from muzzle between eyes and over eyes; ears white-tipped; postauricular patches

Map 458. *Nasua narica* and *Nasua nelsoni*.

1. *N. narica molaris* 2. *N. narica narica* 3. *N. narica yucatanica* 4. *N. nelsoni*

whitish to yellowish; feet blackish; underparts yellowish to dark brown; tail colored about like dorsum, often annulated with yellow and brown.

Nasua narica molaris Merriam

1902. *Nasua narica molaris* Merriam, Proc. Biol. Soc. Washington, 15:68, March 22, type from Manzanillo, Colima.
1904. *Nasua narica pallida* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:53, February 29, type from Sierra Madre, near Guadalupe y Calvo, Chihuahua.
1942. *Nasua narica tamaulipensis* Goldman, Proc. Biol. Soc. Washington, 55:80, June 25, type from Cerro de la Silla, 2600 ft., near Monterrey, Nuevo León.

MARGINAL RECORDS.—Arizona: T. 11 N, R. 12 E, edge of Anderson Mesa (Wetherill, 1957:123); 40 mi. N Clifton (Taber, 1940:13). New Mexico (*ibid.*): W fork Gila River, near Heart Bar Ranch, Gila National Forest; 25 mi. SE Animas. Texas: 20 mi. below Boquillas, Dead Horse Mts. (Goldman, 1942:81); Rio Frio, about 40 mi. N Uvalde (Davis, 1943:501); Brownsville (Goldman, 1942:81). Tamaulipas: Soto la Marina (*ibid.*). Southwestern Oaxaca (Hall and Villa, 1949:446), thence northward along coast to Sonora: Chinobampo (Burt, 1938:29); 2 mi. E Ures (*ibid.*). Arizona: Organ Pipe Cactus National Monument (Cahalane, 1948:249).

INNER MARGINAL RECORDS.—Coahuila: foothills of Carmen Mts. (Goldman, 1942:81). Nuevo León: 12 km. W Allende, 3000 ft. (Davis, 1944:381). Tamaulipas: Ciudad Victoria (Goldman, 1942:81); 19 km. SW Manté (Davis, 1944:381). San Luis Potosí: 3 mi. NE Pujal (Dalquest, 1953b:183); Xilitla (*ibid.*). Morelos: 12 km. NW "Axochipan" (Davis and Russell, 1954:71). Jalisco: Guadalajara (Gaumer, 1917:217). Chihuahua: Sierra Madre, near Guadalupe y Calvo (J. A. Allen, 1904:53). Arizona: W of Hillside, Santa Maria Mts. (Taber, 1940:13).

Nasua narica narica (Linnaeus)

1766. [*Viverra*] *narica* Linnaeus, Syst. nat., ed. 12, 1:64. Type locality, Achotal, Isthmus of Tehuantepec, Veracruz (by restriction, Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:560, July 10, 1951).
1884. *Nasua narica*, True, Proc. U. S. Nat. Mus., 7(App., Circ. 29):608, November 29.
1860. *Nasua solitaria* var. *mexicana* Weinland, Zool. Garten, 1:191. Type locality, near Hacienda El Mirador, about 4000 ft., 20 leagues from Veracruz, Veracruz.
1904. *Nasau narica bullata* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:48, February 29, type from Pozo Azul, San José, Costa Rica. (Regarded as inseparable from *Nasua narica narica* by Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:559, July 10, 1951.)

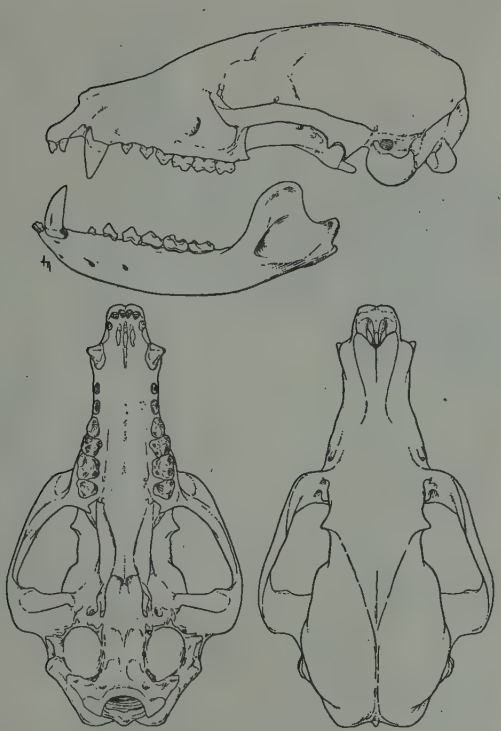


Fig. 481. *Nasua narica narica*, 35 km. SE Jesús Carranza, 400 ft., Veracruz, No. 24531 K.U., ♂, X ½.

1904. *Nasua narica panamensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:51, February 29, type from Boquerón, Chiriquí, Panamá. (Regarded as inseparable from *Nasua narica narica* by Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:559, July 10, 1951.)

1932. *Nasua narica richmondi* Goldman, Jour. Washington Acad. Sci., 22:312, June 4, type from Río Escondido, 50 mi. above Bluefields, Zelaya, Nicaragua. (Regarded as inseparable from *Nasua narica narica* by Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:559, July 10, 1951.)

1942. *Nasua narica isthmica* Goldman, Proc. Biol. Soc. Washington, 55:81, June 15, type from Santa Efigenia, about 8 mi. NW Tapanatepec, Oaxaca. (Regarded as inseparable from *Nasua narica narica* by Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:559, July 10, 1951.)

MARGINAL RECORDS.—Veracruz: Jalapa (J. A. Allen, 1879:165); type locality. Chiapas: 6 mi. SE Palenque (Kuns and Tashian, 1954:102). British Honduras: Kate's Lagoon (Hershkovitz, 1951:560). Honduras: Santa Bárbara (Goodwin, 1942:177), thence along Caribbean Coast to South America; northward along Pacific Coast to Oaxaca: Tehuantepec (Goldman, 1942:82); Guichicovi (*ibid.*). Veracruz: 3 km. N Paraje Nuevo, 1700 ft. (29985 KU).

Nasua narica yucatanica J. A. Allen

1904. *Nasua narica yucatanica* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:52, February 29, type from Chichén-Itzá, Yucatán.

MARGINAL RECORDS.—Yucatán: Chablé (Gaumer, 1917:217); thence along Caribbean Coast to British Honduras: Orange Walk (Gaumer, 1917:217). Guatemala: *Petén* (Handley, 1950:144).

Nasua nelsoni Merriam
Cozumel Island Coati

1901. *Nasua nelsoni* Merriam, Proc. Biol. Soc. Washington, 14:100, July 19, type from Cozumel Island, Quintana Roo. Known only from Cozumel Island.

1901. *Nasua thersites* Thomas, Ann. Mag. Nat. Hist., ser. 7, 8:271, October, type from Cozumel Island, Quintana Roo.

Average external measurements of 3 adult males and 4 adult females, respectively, are: 785, 744; 348, 328; 84, 79. Basal length of skull (type), 95; occipitonasal length, 95; zygomatic breadth, 61. Upper parts, belly, legs, and tail uniform dark seal brown; head and shoulders grizzled with golden fulvous; sides of neck and outer sides of arms grizzled with buffy whitish.

N. nelsoni differs from *N. narica* of the mainland in being smaller, and in having relatively smaller teeth.

Genus **Potos** É. Geoffroy St.-Hilaire and G. Cuvier—Kinkajous

1795. *Potos* É. Geoffroy St.-Hilaire and G. Cuvier, Mag. Encyclopédique, n.s., 2:187. Type, *Viverra caudivolvula* Schreber.

1799. *Kinkajou* Lacépède, Tableau . . . des mammifères, des cétacés et des oiseaux, p. 7. Type, *Viverra caudivolvula* Schreber.

1806. *Caudivolvulus* Dumeril, Zoologie analytique . . . , p. 14. Type, "Le Kinkajou."

1811. *Cercoleptes* Illiger, Prodromus systematis mammalium et avium . . . , p. 127. Type, *Viverra caudivovula* Schreber.

1813. *Kinkashu* Fischer, Zoognosia, ed. 3, 1:14, a renaming of *Kinkajou* Lacépède.

1815. *Aesurus* Rafinesque, Anal. Nat., p. 59, a renaming of *Kinkajou* Lacépède.

Form elongated; head rounded, muzzle pointed; tail long, prehensile; ears short; posterior half of soles densely furred; claws short, sharply pointed; digits partially webbed; limbs short.

Skull short, rounded, highly arched; rostrum short and broad; braincase large, sharply constricted in postorbital region; postorbital processes well developed from frontals, slightly from zygomata; sagittal crest usually developed on forward half of braincase; palate flat, short, and extending only short

distance posterior to plane of maxillary tuberosities; auditory bullae much flattened; mandible heavy, ramus high, straight, and little produced backward.

Teeth large, low-crowned, weakly tuberculate; incisor-canine diastema short; incisors heavy, broad; I3 large and deeply emarginate over posterior fold of cingulum; lower incisors with chisel-shaped crowns; canines large, flattened, emarginate lingually, deeply grooved labially, and nearly straight; premolars large; P2 and P3 simple, with bladelike crested crowns; P4 broad, with long shelf lateral to single internal, low, rounded cusp; M1 twice size of M2, subquadrate, and flat with raised outer rim; M2, m1 and m2 slightly sculptured and almost without tubercles. Dentition, i. $\frac{2}{3}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{2}{2}$ (After Hollister, 1915:149–150.)

Kinkajous are nocturnal, arboreal, and largely frugivorus, although insects comprise a portion of their diet. They customarily travel in small groups when feeding. A litter contains one or two young.

Potos flavus
Kinkajou

External measurements: 815–1123; 397–551; 75–110; 30–45. Greatest length of skull, 87.5–94; basal length, 74–83.5; zygomatic breadth, 54–66. Upper parts tawny olive, yellowish tawny, clay color, or wood brown; black middorsal stripe present in some animals; underparts deep fulvous yellow, buff or brownish yellow; muzzle dark brown to blackish; tail, in general, colored above like upper parts, below like underparts, becoming dark brown distally in some subspecies.

Potos flavus arborensis Goodwin

1938. *Potos flavus arborensis* Goodwin, Amer. Mus. Novit., 987:1, May 13, type from El Sauce Peralta, 1000 ft., less than halfway from San José to Limón, Cartago, Costa Rica.

MARGINAL RECORDS.—Costa Rica: type locality; El Copey de Dota (Goodwin, 1946:429); El Muñeco (*ibid.*).

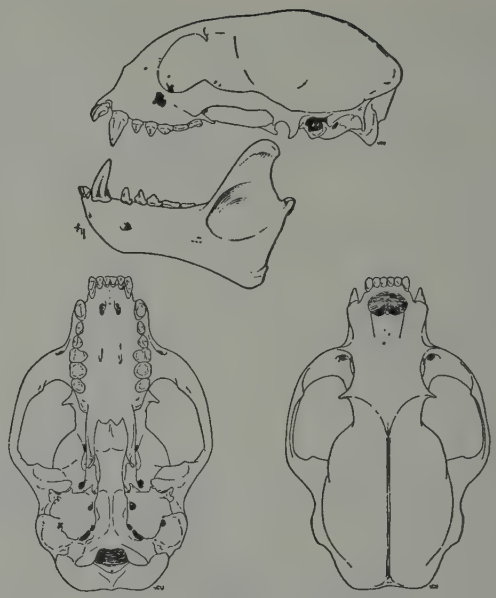


Fig. 482. *Potos flavus aztecus*, 3 km. E San Andrés, Tuxtla, 1000 ft., Veracruz, No. 24532 K.U., ♂, X ½.

Potos flavus aztecus Thomas

1902. *Potos flavus aztecus* Thomas, Ann. Mag. Nat. Hist., ser. 7, 9:268, April, type from Atoyac, Veracruz.

MARGINAL RECORDS.—San Luis Potosí: 10 km. N, 3 km. E Xilitla (Dalquest, 1950:12). Veracruz: type locality.

Potos flavus boothi Goodwin

1957. *Potos flavus boothi* Goodwin, Amer. Mus. Novit., 1830:1, May 3, type from Pueblo Nuevo, Solistahuacán, approx. 60 mi. N Tuxtla Gutiérrez, Chiapas. Known only from the type locality.

Potos flavus campechensis Nelson and Goldman

1931. *Potos flavus campechensis* Nelson and Goldman, Jour. Washington Acad. Sci., 21:482, November 19, type from La Tuxpeña, Champotón, Campeche.

MARGINAL RECORDS.—Campeche: type locality. British Honduras: Kate's Lagoon (Hershkovitz, 1951:561); Double Falls (*ibid.*). Honduras: Santa Bárbara (Goodwin, 1942:177); El Caliche Cedros (*ibid.*). Nicaragua (specimens assigned to *P. f. aztecus* by J. A. Allen, 1910:106, are here provisionally assigned to *campechensis* pending study of this group): Peña Blanca; Ocatal; Uluce; Matagalpa. Guatemala: Finca Salache (Goodwin, 1934:18). Chiapas: 6 mi. SE Palenque, 210 m. (Kuns and Tashian, 1954:102). *Tabasco* (Goodwin, 1942:177).

Potos flavus chiriquensis J. A. Allen

1904. *Potos flavus chiriquensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:72, February 29, type from Boquerón, Chiriquí, Panamá.

Map 459. *Potos flavus.*

1. *P. f. arborensis*
2. *P. f. aztecus*
3. *P. f. boothi*
4. *P. f. campechensis*
5. *P. f. chiriquensis*
6. *P. f. dugesii*
7. *P. f. guerrerensis*
8. *P. f. isthmicus*

MARGINAL RECORDS.—Panamá (Goldman, 1920: 160): Gatún; Parida Island; type locality. Costa Rica: San Gerónimo de Pirrís (Goodwin, 1946:429).

Potos flavus dugesii Villa

1944. *Potos flavus dugesii* Villa, Anal. Inst. Biol. Univ. Nac. México, 15:323, type from SE La Esperanza coffee plantation, 45 km. NW Huixtla, 760 m., Chiapas.

MARGINAL RECORDS.—Chiapas: San Cristóbal (Villa, 1944:323); Finca Germania (*ibid.*); Paval, 480 m. (Villa, 1949:503).

Potos flavus guerrerensis Goldman

1915. *Potos flavus guerrerensis* Goldman, Proc. Biol. Soc. Washington, 28:133, June 29, type from Ometepec, Guerrero.

MARGINAL RECORDS.—Guerrero: type locality; Papayo (Goldman, 1915:134).

Potos flavus isthmicus Goldman

1913. *Potos flavus isthmicus* Goldman, Smiths. Miscl. Coll., 60(22):14, February 28, type from near head of Río Limón, 5200 ft., Mt. Pirri, Darién, Panamá.

MARGINAL RECORDS (Goldman, 1920:159).—Panamá: type locality; Tacarcuna; *Tapalisa.*

Genus Bassaricyon J. A. Allen—Olingos

1876. *Bassaricyon* J. A. Allen, Proc. Acad. Nat. Sci. Philadelphia, 28:20, April 18. Type, *Bassaricyon gabbii* J. A. Allen.

Form elongated, head flattened, muzzle pointed; ears small, rounded; tail longer than head and body; posterior half of soles of feet furred; toes semipalmate; claws short, curved, sharply pointed; baculum small, slightly bowed, indistinctly bilobed anteriorly.

Skull short and broad; rostrum depressed, short; postorbital processes well developed from frontals and zygomata; orbits large; sagittal crest absent; palate flat, extending backward, having shallow lateral grooves; vomer not attached to palatal bones; posterior half of auditory bullae greatly inflated, anterior half low, flattened; tube of external auditory meatus short; mandible light, ascending ramus long and high.

Cheek-teeth low-crowned, only slightly cusped; canines large, not much flattened; upper canines nearly straight, not bowed outward; P1 and P2 compressed cones; P3 with posterointernal shelf; P4 with 3 cusps, hypocone lacking; M1 larger than M2;

upper molars with 3 low, rounded cusps, and with well-developed outer cingulum. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{2}{2}$.

Olingos are nocturnal, arboreal, and frugivorus. When feeding, several may occur together. Where olingos and kinkajous occur, the 2 species may feed in the same tree. All named kinds of Central American *Bassaricyon* probably will prove to be a single species (*gabbii*) when sufficient material from that area is available.

KEY TO NORTH AMERICAN SPECIES OF BASSARICYON

1. Upper parts brownish; found in Nicaragua, Costa Rica, and Panamá, but not at Estrella de Cartago, Costa Rica, or at Cerro Pando, Panamá. . . . . *B. gabbii*, p. 896

1′. Upper parts grayish; occurring at Estrella de Cartago, Costa Rica, and at Cerro Pando, Panamá.

2. Tail edged with hairs of a silvery sheen; ears gray, edged with white; found only at Estrella de Cartago, Costa Rica. *B. lasius*, p. 897

2′. Tail not edged with hairs of a silvery sheen; ears brown, edged with white; found only at Cerro Pando, Panamá. *B. pauli*, p. 897

Bassaricyon gabbii
Bushy-tailed Olingo

External measurements of a male and a female, respectively, are: 950, 850; 480, 432; 80, 90 [*sic*]. Condylobasal length, 80.5, 78.7; zygomatic breadth, 53, 53; length of maxillary tooth-row, 28, 28.4. Upper parts pinkish buff to golden finely mixed with black; top of head and face grayish; ears edged with buffy white; underparts light yellowish buff. Tail above like dorsum, grayer below.

Bassaricyon gabbii gabbii J. A. Allen

1876. *Bassaricyon gabbii* J. A. Allen, Proc. Acad. Nat. Sci., Philadelphia, 28:21, April 18, type from Talamanca, Limón, Costa Rica.

MARGINAL RECORDS.—Panamá (Goldman, 1920:157): near Gatún; Corozal. Costa Rica: type locality.

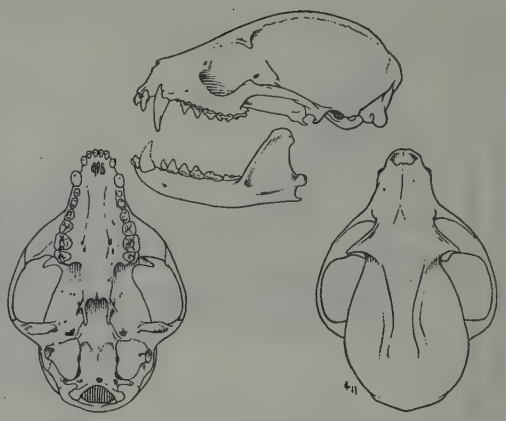


Fig. 483. *Bassaricyon gabbii orinomus*, Cana, Panamá, No. 179157 U.S.N.M., ♂, holotype, drawn from photographs, approximately X ½.

Bassaricyon gabbii orinomus Goldman

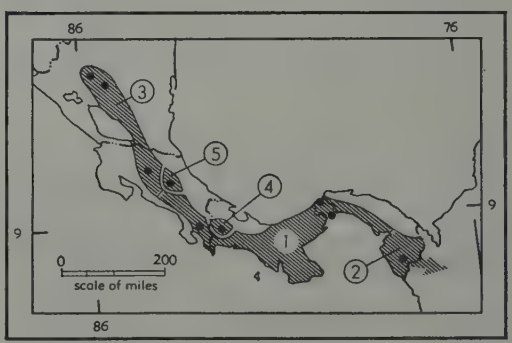
1912. *Bassariscyon* [*sic*] *gabbi orinomus* Goldman, Smiths. Miscl. Coll., 60(2):16, September 20, type from Cana (Santa Cruz de Cana), 1800 ft., upper Río Tuyra, Darién, Panamá.

MARGINAL RECORDS (Goldman, 1920:157).—Panamá: Mount Pirre; *type locality*.

Bassaricyon gabbii richardsoni J. A. Allen

1908. *Bassaricyon richardsoni* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:662, October 13, type from Rio Grande, below 1000 ft., Atlantic slope, Nicaragua.

1946. *Bassaricyon gabbii richardsoni*, Goodwin, Bull. Amer. Mus. Nat. Hist., 87:426, December 31.



Map 460. Three species of *Bassaricyon*.

Guide to kinds
1. *B. gabbii gabbii*
2. *B. gabbii orinomus*
3. *B. gabbii richardsoni*
4. *B. pauli*
5. *B. lasius*

MARGINAL RECORDS (Goodwin, 1946:427).—Nicaragua: Matagalpa; type locality. Costa Rica: Lajas Villa Quesada.

Bassaricyon pauli Enders
Chiriquí Olingo

1936. *Bassaricyon pauli* Enders, Proc. Acad. Nat. Sci. Philadelphia, 88:365, September 29, type from Cerro Pando, 4800 ft., between Río Chiriquí Viejo and Río Colorado (about 10 mi. from El Volcán), Chiriquí, Panamá. Known only from type locality.

External measurements of the type, an adult male, are: 862, 434, 84, 38 (crown). Weight, 1.58 kg. Condylo-premaxillary length, 80; zygomatic breadth, 57; breadth of braincase, 36.7. Upper parts grizzled, head gray and black, body gray-fulvous; middorsal stripe of black-tipped hairs; underparts light gray tinged with yellow; black tail-rings faint, ventral surface of tail darker than underparts of body.

Skull massive, wide rostrally, and deep; braincase large and uniformly expanded; zygomatic arch heavy; tympanic bullae large, heavy; glenoid fossa wide and deep, with well-developed processes.

B. pauli is probably only subspecifically distinct from the other nominal species from Central America of this genus, but sufficient material to demonstrate this is not yet available.

Bassaricyon lasius Harris
Harris' Olingo

1932. *Bassaricyon lasius* Harris, Occas. Papers Mus. Zool., Univ. Michigan, 248:3, August 4, type from Estrella de Cartago, about 4500 ft., near source of Río Estrella, 6 or 8 mi. S Cartago, Cartago, Costa Rica. Known only from type locality.

External measurements of the type, an adult male, are: 820, 437, 77, 35 (crown). Condylo-premaxillary [= condylobasal ?] length of skull, 78.3; zygomatic breadth, 55; breadth of braincase, 36.8. Upper parts grizzled blackish gray, median line of back slightly more blackish; ears gray, edged with white; underparts light yellowish buff; tail above like back, light gray below. (After Harris, 1932:3.)

B. lasius closely resembles *B. g. richardsoni* and may be only subspecifically distinct from the other Central American olingos.

FAMILY MUSTELIDAE—Mustelids

Small (*Mustela*) to medium (*Gulo*) size; short-legged; feet short; 5 toes on each foot; plantigrade, semiplantigrade or digitigrade; anal scent glands paired and large; rostrum of skull short; alisphenoid canal absent; carnassial teeth (P4 and m1) sectorial in varying degree; molars $\frac{1}{2}$ or $\frac{1}{1}$.

KEY TO NORTH AMERICAN GENERA OF MUSTELIDAE

1. Premolars $\frac{4}{4}$. . . . . *Martes*, p. 898
1′. Premolars fewer than $\frac{4}{4}$.
  2. Fleshy part of tail so thickened at base that tail merges gradually with body; toes of four feet webbed at least as far as terminal phalanx of each toe.
    3. Premolars $\frac{4}{3}$. . . . . *Lutra*, p. 943
    3′. Premolars $\frac{3}{3}$. . . . . *Enhydra*, p. 948
  2′. Fleshy part of tail not so thickened at base as to cause tail to merge gradually with body; toes of four feet not webbed so far distally as terminal phalanx of each toe.
    4. Premolars $\frac{4}{3}$ . . . . . *Gulo*, p. 922
    4′. Premolars $\frac{3}{3}$ or $\frac{2}{3}$.
      5. Premolars $\frac{2}{3}$. . . . . *Conepatus*, p. 939
      5′. Premolars $\frac{3}{3}$.
        6. Talonid of m1 trenchant.
          7. Venter white or brown. . . . . *Mustela*, p. 903
          7′. Venter black. . . . . *Galictis*, p. 921
        6′. Talonid of m1 basined or semibasined.
          8. Sides of head not solid black (gray or brown in *Eira*); palate projecting behind molars for a distance of more than length of M1; basilar length more than 80.
            9. Tail less than ⅛ of total length; longitudinal white stripe on top of neck. *Taxidea*, p. 925
            9′. Tail more than ⅛ of total length; no longitudinal white stripe on top of neck. *Eira*, p. 919
          8′. Side of head all black; palate not projecting behind molars for a distance of more than length of M1; basilar length less than 80.
            10. Upper parts having four or more lines of broken white stripes or spots. *Spilogale*, p. 929
            10′. Upper parts having unbroken white stripes or upper parts all black except white top of head. . . . . *Mephitis*, p. 933

Genus Martes Pinel—Martens and Fisher

1792. *Martes* Pinel, Actes Soc. Hist. Nat. Paris, 1:55. Type, *Martes domestica* Pinel [= *Mustela foina* Erxleben].
1829. *Zibellina* Kaup, Skizzirte Entwickelungs-Geschichte und natürliches System der europäischen Thierwelt, 1:31, 34. Type, *Mustela zibellina* Linnaeus.
1865. *Pekania* Gray, Proc. Zool. Soc. London, p. 107, June. Type, *Mustela pennanti* Erxleben.
1865. *Charronia* Gray, Proc. Zool. Soc. London, p. 108, June. Type, *Mustela flavigula* Boddaert.
1928. *Lamprogale* Ognev, Mem. Soc. Amis. Sci. Nat. Moscow, No. 2, Zool., p. 26, 30. Proposed to replace *Charronia* Gray thought by Ognev to be preoccupied by *Charonia* Gistel, 1848, a genus of Mollusca.

Total length, 570–1033; weight, 1½–12 and perhaps 18 lbs.; basilar length, 60–115. Facial angle slight; tympanic bullae moderately inflated but not in close contact with paroccipital processes; palate behind last upper molars; inner moiety of M1 larger than outer; P4 with simple deuterocone; in m1, trigonid longer than talonid, metaconid small and appressed to protoconid, hypoconid large, talonid semibasined. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{1}{2}$

KEY TO NORTH AMERICAN SPECIES OF MARTES

1. Tail more than 290; outside length of P4 more than 9.5; length of m1 more than 11. *M. pennanti*, p. 901
1′. Tail less than 290; outside length of P4 less than 9.5; length of m1 less than 11. *M. americana*, p. 898

Martes americana
Marten

External measurements: males 570–682, 170–240, 79–90, weight up to 2¾ lbs.; females, 513–560, 165–195, 70–78, weight up to 0.85 kg. Basilar length, 60–75. Golden brown, deepening to blackish brown on feet and tip of tail, orange or yellowish on throat or chest, head grayish in some subspecies.

Martens are arboreal, feed principally on rodents, especially squirrels of the genus *Tamiasciurus*, are active all winter, although they hole up for a day or two, travel up to 10 miles in a night, bear 1 litter of 3 or 4 young per year after a long gestation period of 259 to 275 days, and yield a valuable fur.

Martes americana abieticola (Preble)

1902. *Mustela americana abieticola* Preble, N. Amer. Fauna, 22:68, October 31, type from Cumberland House, Saskatchewan.
1912. *Martes americana abieticola*, Miller, Bull. U.S. Nat. Mus., 79:92, December 31.

MARGINAL RECORDS.—Saskatchewan: northern part (Anderson, 1947:58). Manitoba (Preble, 1902:68): Fort Churchill; Oxford House; Norway House. Saskatchewan: type locality.

Martes americana abietinoides Gray

1865. [*Martes americana*] var. 1., *abietinoides* Gray, Proc. Zool. Soc. London, p. 106, June. Type locality, "Edge of the humid western slope of the Rocky Mountains, somewhere between Kicking Horse Pass and the Columbia River." (See Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 54:451, 1902.)
1912. *Martes americana abietinoides*, Miller, Bull. U.S. Nat. Mus., 79:93, December 31.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:302): Fort Grahame; Little Prairie. Alberta: Jasper National Park (Anderson, 1947:58). British Columbia: Golden (Cowan and Guiguet, 1956:302). Alberta: Banff National Park (Anderson, 1947:58). Montana: Whitefish Range (Wright, 1953:75). Idaho (*ibid.*): NE of Coeur d'Alene; Coolin. British Columbia (Cowan and Guiguet, 1956:302): Manning Park; Wistaria P.O.; Sustut River.

Martes americana actuosa (Osgood)

1900. *Mustela americana actuosa* Osgood, N. Amer. Fauna, 19:43, October 6, type from Fort Yukon, Alaska.
1912. *Martes americana actuosa*, Miller, Bull. U.S. Nat. Mus., 79:93, December 31.
1905. *Mustela boria* Elliot, Proc. Biol. Soc. Washington, 18:139, April 18, type from Lower Mackenzie River District, toward Arctic Ocean; exact locality unknown. Regarded by Preble (N. Amer. Fauna, 27:236–237, October 26, 1908) as indistinguishable from *M. americana actuosa*.

MARGINAL RECORDS.—Mackenzie: Mackenzie Delta (Porsild, 1945:10); Fort Anderson (Preble, 1908:238); 75 mi. W Contwoyto Lake (Banfield, 1951:116). Alberta: Fort Chipewyan (Preble, 1908:237); Fort McMurray (J. A. Allen, 1910:11); near Henry House (Preble, 1908:237). British Columbia: vicinity of Laurier Pass (Sheldon, 1932: 201); lower Iskut River (Cowan and Guiguet, 1956:303). Yukon: Quiet Lake (Rand, 1945a:28). Alaska: Georgetown (Dice, 1921:21); Andreafski (*ibid.*); Hunt Fork, John

River (Rausch, 1950:465); 30 mi. NE Arctic Village (Rausch, 1953:112).

Martes americana americana (Turton)

1806. [*Mustela*] *americanus* Turton, A general system of nature . . . , 1:60. Type locality, eastern North America.
1912. *Martes americana americana,* Miller, Bull. U.S. Nat. Mus., 79:92, December 31.
1820. *Mustela leucopus* Kuhl, Beiträge zur Zoologie . . . , p. 74. Type locality, Canada.
1823. *Mustela Huro* F. Cuvier, Dictionaire des sciences naturelle . . . , 29:256. Type locality, upper Canada.
1874. *M*[*ustela*]. *martinus* Ames, Bull. Minnesota Acad. Nat. Sci., 1(No. 2):69. (Listed as "M. martinus *Sabine* Martin" two lines below "Mustela americana *Turton* Sable" under the title of "Mammalia of Minnesota.")

MARGINAL RECORDS.—Ontario: Trout Lake (de Vos, 1952:33). Quebec: Lake Mistassini (Anderson, 1947:57). Massachusetts: Berkshire County (Coues, 1877:94). Pennsylvania (Rhoads, 1897:218): mountains N of Benton; Shippen Township. Ohio (Bole and Moulthrop, 1942:121): vicinity of Chillicothe; Ashtabula County. Michigan (Burt, 1946:129): Sanilac County; Allegan County. Illinois: Cook County (G. M. Allen, 1942a:168). Wisconsin: Marathon County (Cory, 1911:383). Minnesota: Duluth (Swanson, 1945:64). North Dakota (V. Bailey, 1927:176): Grand Forks; Pembina River.

Martes americana atrata (Bangs)

1897. *Mustela atrata* Bangs, Amer. Nat., 31:162, February, type from Bay St. George, Newfoundland. Known only from Newfoundland.
1942. *Martes americana atrata,* G. M. Allen, Extinct and vanishing mammals . . . , special publ. No. 11, Amer. Comm. for International Wild Life Protection, p. 166.

Martes americana brumalis (Bangs)

1898. *Mustela brumalis* Bangs, Amer. Nat., 32:502, July, type from Okkak, Labrador.
1934. *Martes americana brumalis,* Anderson, Mammals of the eastern Arctic and Hudson Bay, *in* Canada's Eastern Arctic, Dept. Interior, Ottawa, p. 95.

MARGINAL RECORDS.—Quebec: Chimo (Anderson, 1947:58); region of Belle Isle (Anderson, 1939:52).

Martes americana caurina (Merriam)

1890. *Mustela caurina* Merriam, N. Amer. Fauna, 4:27, October 8, type from near Grays Harbor, Grays Harbor Co., Washington.
1953. *Martes americana caurina,* Wright, Jour. Mamm., 34: 84, February 9.

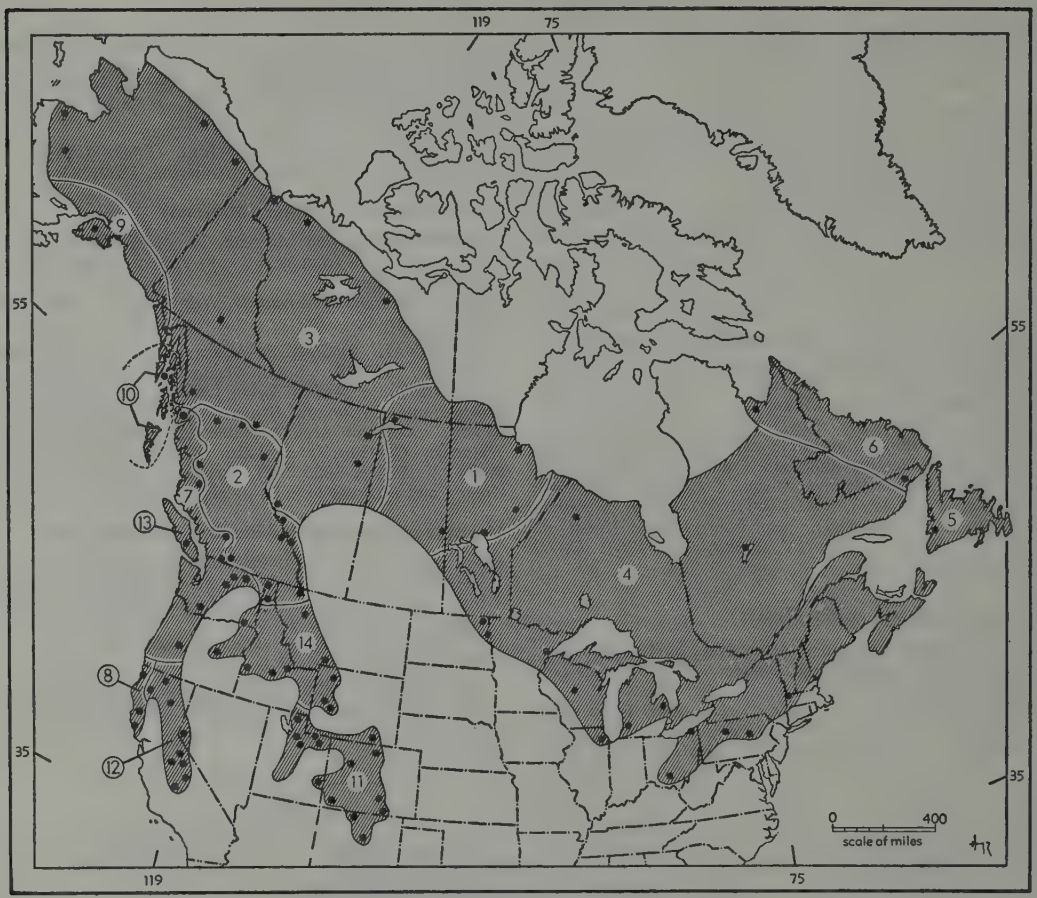
MARGINAL RECORDS.—Alaska: Alaskan Panhandle (Anderson, 1947:59). British Columbia (Cowan and Guiguet, 1956:303): Anahim Lake; Lillooet; Lightning Creek. Washington (Taylor and Shaw, 1929:10, unless otherwise noted): mountains near Republic (Dalquest, 1948:186); Riverside; Chelan; Trout Lake. Oregon: Three Sisters Peaks (V. Bailey, 1936:297), thence to coast of southern Oregon and up coast to point of beginning.

Martes americana humboldtensis Grinnell and Dixon

1926. *Martes caurina humboldtensis* Grinnell and Dixon, Univ. California Publ. Zool., 21:411, March 17, type from ridge about 5 mi. NE Cuddeback [Carlotta], Humboldt Co., California.
1953. *Martes americana humboldtensis,* Wright, Jour. Mamm., 34:85, February 9.

MARGINAL RECORDS.—California: 12 mi. NE Requa (Hall, 1926:8); Longvale (Grinnell, *et al.,* 1937:209); neighborhood of Fort Ross (*ibid.*), thence up coast to point of beginning.

Fig. 484. *Martes americana sierrae,* Marlette Lake, Nevada, No. 69634 M.V.Z., subadult ♂, X 1.



Map 461. *Martes americana.*

Guide to subspecies
1. *M. a. abieticola*
2. *M. a. abietinoides*
3. *M. a. actuosa*
4. *M. a. americana*
5. *M. a. atrata*
6. *M. a. brumalis*
7. *M. a. caurina*
8. *M. a. humboldtensis*
9. *M. a. kenaiensis*
10. *M. a. nesophila*
11. *M. a. origenes*
12. *M. a. sierrae*
13. *M. a. vancouverensis*
14. *M. a. vulpina*

Martes americana kenaiensis (Elliot)

1903. *Mustela americana kenaiensis* Elliot, Field Columb. Mus., Publ. 72, Zool. Ser., 3:151, March 20, type from Kenai Peninsula, Alaska.

1912. *Martes americana kenaiensis,* Miller, Bull. U.S. Nat. Mus., 79:93, December 31.

Limits of range unknown. See Schiller and Rausch (1956: 195) for *Katmai National Mon.,* Alaska.

Martes americana nesophila (Osgood)

1901. *Mustela nesophila* Osgood, N. Amer. Fauna, 21:33, September 26, type from Massett, Graham Island, Queen Charlotte Islands, British Columbia.

1953. *Martes americana nesophila,* Wright, Jour. Mamm., 34:85, February 9.

MARGINAL RECORDS.—Alaska: Three-mile Arm, Kuiu Island (Swarth, 1911:139). British Columbia: *type locality.*

Martes americana origenes (Rhoads)

1902. *Mustela caurina origenes* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 54:458, September 30, type from Marvine Mtn., Garfield Co., Colorado.

1953. *Martes americana origenes,* Wright, Jour. Mamm., 34:84, February 9.

MARGINAL RECORDS.—Utah (Durrant, 1952:424): Cache County; Henry's Fork. Wyoming: 3 mi. ESE Browns Peak (16787 KU). Colorado (Cary, 1911:190): divide E of Laramie River; Sangre de Cristo Range; headwaters Cimarron River. New Mexico (V. Bailey, 1932:322): near Chama; near Truchas Peaks. Colorado: La Plata Mts. (Cary, 1911:190). Utah: San Juan Mts. (Durrant, 1952:424). Colorado: Divide Creek (Cary, 1911:190). Utah (Durrant, 1952:424): Paradise Park, 10,000 ft.; Wasatch County; Salt Lake County.

Martes americana sierrae Grinnell and Storer

1916. *Martes caurina sierrae* Grinnell and Storer, Univ. California Publ. Zool., 17:2, August 23, type from head of Lyell Canyon, Yosemite National Park, California.
1953. *Martes americana sierrae*, Wright, Jour. Mamm., 34: 85, February 9.

MARGINAL RECORDS (Grinnell, *et al.*, 1937:189, unless otherwise noted).—California: near Weed; *Mt. Shasta*; Warner Creek, 6600 ft. Nevada: 1 mi. E, 2 mi. S Incline, 6300 ft. (22424 KU). California: Virginia Lakes, 10,000 ft.; vicinity of Mammoth (A. B. Howell, 1924:28); *½ mi. W Bishop* (Jones, 1955:568); Whitney Meadows, 9800 ft.; Jordan Hot Springs; Mt. Raymond; Canyon Creek; *Jackson Lake, 5900 ft.*

Martes americana vancouverensis Grinnell and Dixon

1926. *Martes caurina vancouverensis* Grinnell and Dixon, Univ. California Publ. Zool., 21:414, March 17, type from Golden Eagle Mine, 20 mi. S Alberni, Vancouver Island, British Columbia. Restricted to Vancouver Island. (Not recognized as subspecifically distinct from *M. a. caurina* by Cowan and Guiguet, Handbook No. 11 of British Columbia Provincial Museum, p. 304, July 15, 1956.)
1953. *Martes americana vancouverensis*, Wright, Jour. Mamm., 34:85, February 9.

Martes americana vulpina (Rafinesque)

1819. *Mustela vulpina* Rafinesque, Amer. Jour. Sci., p. 82. Type locality, "regions watered by the Missouri." Characterized by tail white at end—a variation that occurs in American as well as Old World *Martes* (see de Vos, Ecology and management of fisher and marten in Ontario, Tech. Bull., Ontario Dept. Lands and Forests, pp. 22, 23, 1952).

MARGINAL RECORDS.—Montana (Wright, 1953:75): Sun River region; Red Lodge region. Wyoming: 19 mi. S, 19 mi. W Cody (39405 KU); 17½ mi. S, 6½ mi. W Lander, 8450 ft. (37343 KU); Middle Lake, 20½ mi. W, 2 mi. S Lander (32329 KU). Idaho (Davis, 1939:133): Salmon River (Lemhi) Mts.; Baker Creek, 12 mi. N Ketchum; near Fort Boise. Oregon: Strawberry Butte (V. Bailey, 1936: 297). Washington: Blue Mts. (Dalquest, 1948:186). See also specimen taken in January, 1930, in Black Hills of South Dakota (Over and Churchill, "Mammals of South Dakota," p. 13, 1945); this specimen, whether a natural occurrence or an escapee from a fur-farm, might belong to the subspecies *M. a. vulpina*, but the occurrence is not shown on Map 461. Names other than *vulpina* were used in the references here cited under marginal records.

Martes pennanti
Fisher

External measurements: males 990–1033, 381–422, 113–128, weight up to 15 lbs. (possibly up to 18 lbs.); females 830–900, 340–380, 89–115; weight up to 6 lbs. Basilar length, 87–108. Dark brown, grayish on foreparts, blackish on rump, legs and tail; tail entirely black.

The fisher is at home in trees, feeds principally on rodents, including the porcupine, has a litter of 2–4 young after a gestation period of 352 (338–358) days and yields a valuable fur. The finer-furred pelt of the female in many years sells for twice as much as the pelt of the male.

Martes pennanti columbiana Goldman

1935. *Martes pennanti columbiana* Goldman, Proc. Biol. Soc. Washington, 48:176, November 15, type from Stuart Lake, near headwaters of Fraser River, British Columbia.

MARGINAL RECORDS.—Mackenzie: Simpson (Anderson, 1937:106, as *M. p. pennanti*); Great Slave Lake (Seton, 1929:vol. 2, 457). Alberta: Fort Smith (Goldman, 1935:177). Manitoba (Goldman, 1935:177): Cross Lake; Oxford House. Alberta: Prairie Creek, 250 mi. W Edmonton (*ibid.*). Idaho: junction of Haystack and Big creeks (Rust, 1946:314). Utah: Trial Lake (Durrant, 1952:425). Idaho: Alturas Lake (Davis, 1939:133). British Columbia: Lightning Lake (Goldman, 1935:177, but referred by Cowan and Guiguet, 1956:308, to the western subspecies); Wistaria (Cowan and Guiguet, 1956:306). Yukon: extreme southern Yukon (Anderson, 1947:60).

Martes pennanti pacifica (Rhoads)

1898. *Mustela canadensis pacifica* Rhoads, Trans. Amer. Philos. Soc., n.s., 19:435, September, type from Lake Keechelus, Kittitas Co., Washington.
1912. *Martes pennanti pacifica*, Miller, Bull. U.S. Nat. Mus., 79:94, December 31. (Regarded as inseparable from

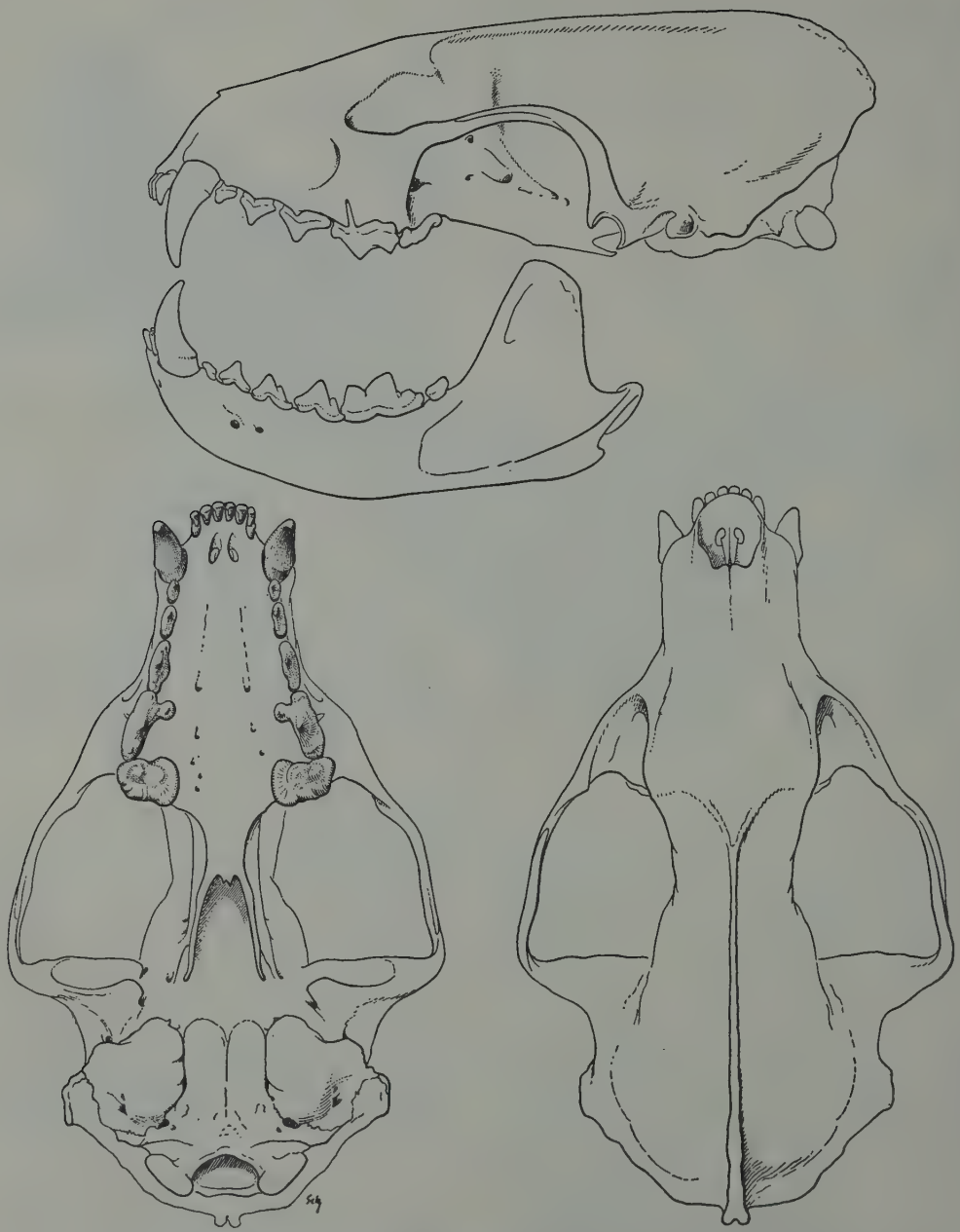
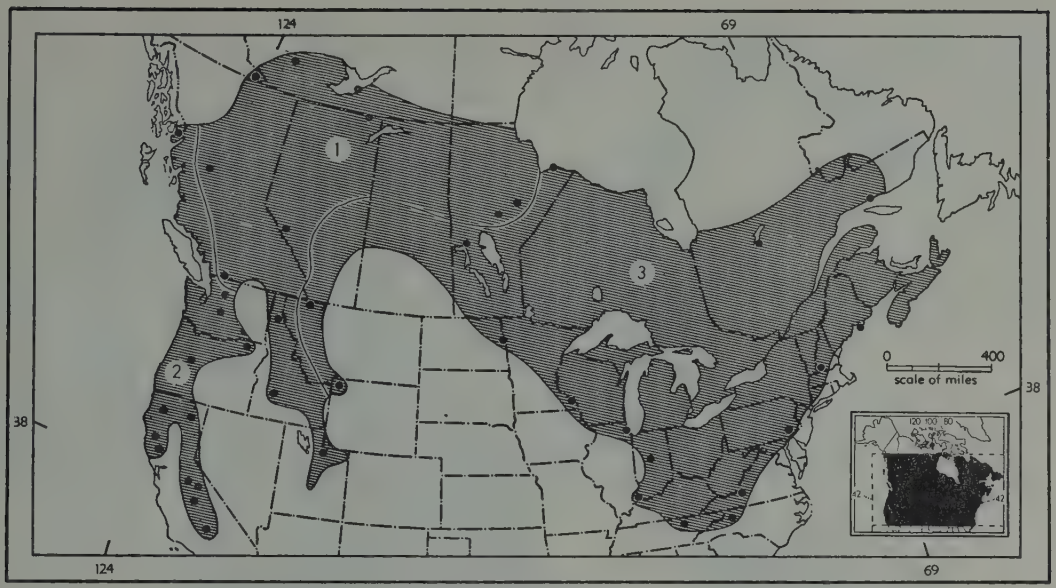


Fig. 485. *Martes pennanti pacifica*, Chinquapin, Yosemite National Park, Mariposa Co., California, No. 23668 M.V.Z., ♂, X 1.



Map 462. *Martes pennanti.*

1. *M. p. columbiana* 2. *M. p. pacifica* 3. *M. p. pennanti*

M. p. pennanti by Grinnell, Dixon and Linsdale, The furbearing mammals of California, 1:217, July 22, 1937, but see Goldman, Proc. Biol. Soc. Washington, 48:177, November 15, 1935.)

MARGINAL RECORDS.—Alaska: southern Alaskan Panhandle (Anderson, 1947:60). Washington (Taylor and Shaw, 1929:10): head of Lake Chelan; Easton. Oregon (V. Bailey, 1936:298–299): Blue Mts.; Lane County. California (Grinnell, *et al.*, 1937:215–216, 228, as *M. pennanti*): Rock Creek Mts. near Cassel; *near Hetch Hetchy Valley*; Yosemite Valley; *Atwell's Mill*; Greenhorn Mts.; Northfolk; Buck Meadows; *Stonyford*; near Lakeport; Cahto; Denny, thence northward along coast to point of beginning.

Martes pennanti pennanti (Erxleben)

1777. [*Mustela*] *pennanti* Erxleben, Systema regni animalis . . . , p. 470. Type locality, Eastern Canada (= Quebec).

1912. *Martes pennanti pennanti*, Miller, Bull. U.S. Nat. Mus., 79:94, December 31.

1777. *Mustela canadensis* Schreber, Die Saügthiere . . . , 3:492, pl. 126 (see Rhoads, Trans. Amer. Philos. Soc., n.s., 19:426, 434, September, 1898). Type: based on the Pekan of Buffon.

1784. *Mustela melanorhyncha* Boddaert, Elenchus animalium, p. 88. Type: based on Fisher of Pennant.

1800. *Viverra piscator* Shaw, General zoology . . . , 1:414. Type: based on Fisher of Pennant.

1802. *Mustela nigra* Turton, A general system of nature . . . , p. 60. Type: based on *Fisher Weasel* (of Pennant?).

1829. Mustela Canadensis *varietas alba*, Richardson, Fauna Boreali-Americana, p. 54. Type: based on an albinistic Pekan in Hudson's Bay Museum.

1829. *Mustela godmani* Fischer, Synopsis mammalium, p. 217. Based on *M. Pennanti* Godman, Amer. Nat. Hist., p. 203.

MARGINAL RECORDS.—Manitoba: 60 mi. E York Factory (Preble, 1902:69). Quebec: Mistassini (Rand, 1945a: 30); Mingan (Bangs, 1898:504). Maine: Mt. Desert Island (Manville, 1942:393). New Hampshire: Monadnock (Seton, 1929:454 of vol. 2). Massachusetts: *vicinity of Williamstown* (Coues, 1877:69). Pennsylvania: Mill Creek, about 3 mi. E Lancaster (Rhoads, 1897:219). Virginia: Peter's Mtn. (Handley and Patton, 1947:130). North Carolina: south in Allegheny Mts. to North Carolina (Anderson, 1947:59). Tennessee: near Flat Rock (G. M. Allen, 1942a: 177). Indiana (Lyon, 1936:101): Posey County; Hamilton County. Illinois: Cook County (Cory, 1912:387). Wisconsin: Mississippi bottomlands near La Crosse (Swanson, 1945:64). North Dakota: Grand Forks (V. Bailey, 1927: 177). Wyoming: Yellowstone Park (Anderson, 1947:59). Montana: Glacier National Park (V. Bailey, 1918:90). Manitoba: N coast Lake Winnipegosis (Seton, 1929:457 of vol. 2).

Genus Mustela Linnaeus—Weasels, Ferret and Minks

1758. *Mustela* Linnaeus, Syst. nat., ed. 10, 1:45. Type, *Mustela erminea* Linnaeus (see Thomas, Proc. Zool. Soc. London, p. 138, March 22, 1911).

Total length, 190–700; legs short; body long; basilar length, 16–70; facial angle slight; tympanic bullae greatly inflated (moderately in subgenus *Lutreola*), cancellous, and with paroccipital processes closely appressed to bullae; palate behind upper molars; inner moiety of M1 larger than outer; P4 with simple deuterocone; in m1 trigonid longer than talonid, metaconid absent (incipiently developed in subgenus *Lutreola*), and talonid trenchant. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{2-3}{3-2}$, m. $\frac{1}{2}$.

Species of this genus are carnivorous in the strict sense of the term and are terrestrial except the mink (*Mustela vison*), which is almost as much at home in the water as on land.

KEY TO NORTH AMERICAN SPECIES OF MUSTELA

1. Length of upper tooth-rows less than 20 in males and 17.8 in females.
   2. Postglenoidal length of skull more than 47 per cent of condylobasal length.
      3. Tail without black pencil and with at most few black hairs at extreme tip; in both sexes mastoid breadth ordinarily exceeds breadth of braincase. *M. rixosa*, p. 908
      3′. Tail with black pencil; in females mastoid breadth ordinarily exceeded by breadth of braincase. *M. erminea*, p. 904
   2′. Postglenoid length of skull less than 47 per cent of condylobasal length. *M. frenata*, p. 909
1′. Length of upper tooth-rows more than 20 in males and 17.8 in females.
   4. Abdomen white; face with blackish mask; m1 lacking even trace of metaconid; distance between upper canines more than width of basioccipital as measured between foramina situated midway along medial sides of tympanic bullae. *M. nigripes*, p. 914
   4′. Abdomen dark brown, like back; face uniformly brown without blackish mask; m1 with incipient metaconid; distance between upper canines less than width of basioccipital as measured between foramina situated midway along medial sides of tympanic bullae.
      5. Length of upper molar-premolar tooth-row more than 20. *M. macrodon*, p. 919
      5′. Length of upper molar-premolar tooth-row less than 20. *M. vison*, p. 916

Subgenus Mustela Linnaeus—Weasels

Revised by Hall, Univ. Kansas Publ., Mus. Nat. Hist., 4:1–466, 41 pls., 31 figs., December 27, 1951.

1758. *Mustela* Linnaeus, Syst. nat., ed. 10, 1:45. Type, *Mustela erminea* Linnaeus (see Thomas, Proc. Zool. Soc. London, p. 138, March 22, 1911).

1829. *Arctogale* Kaup, Skizzirte Entwickelungs-Geschichte und natürliches System der europäischen Thierwelt, 1:30. Type, *Mustela erminea* Linnaeus, at least in part.

1829. *Ictis* Kaup, Skizzirte Entwickelungs-Geschichte und natürliches System der europäischen Thierwelt, 1:30. Type, *Mustela vulgaris* Erxleben [= *Mustela nivalis* Linnaeus]. Not Schinz, 1824–1828.

1841. *Gale* Wagner, *in* Schreber, Die Saügthiere . . . , Suppl., 2:234. Type, *Mustela vulgaris* Erxleben [= *Mustela nivalis* Linnaeus].

1865. *Neogale* Gray, Proc. Zool. Soc. London, p. 114, June. Included *Mustela brasiliensis* Sevastianoff, *Mustela aureoventris* Gray, and *Mustela xanthogenys* Gray [all are subspecies of *Mustela frenata* Lichtenstein].

1871. *Mustelina* Bogdanov, M., Ptitzy i zveri chernozemnoi polosy Povolzhiya, Tr. obshtshevstva est. pri Imp. Kazan Univ. 1:167. Based on *Mustela erminea* Linnaeus and *Mustela vulgaris* Erxleben [= *Mustela nivalis* Linnaeus].

1899. *Eumustela* Acloque, Faunae de France, mammifères, p. 62. Based on *Mustela vulgaris* Erxleben [= *Mustela nivalis* Linnaeus] and *Mustela erminea* Linnaeus.

Mustela erminea

Ermine

Total length in males, 225–340, and in females, 190–290; tail-vertebrae 16–19 in number and their combined length 30 to 45 per cent of length of head and body; tail with distinct black pencil. Braincase long, precranial portion of skull short; postglenoidal length, when expressed as a percentage of the condylobasal length, more than 48 in females and ordinarily more than 46 in males. Upper parts brown; underparts whitish; whitish color ordinarily continuous from chin to inguinal region but in subspecies in humid region along Pacific Coast interrupted in some individuals by brown of upper parts encircling body in abdominal region. Differs from *Mustela rixosa* in presence of black pencil on tail, tail-vertebrae more than ¼ of length of head and body, and, in regions where the 2 species occur together, basilar length of skull more than 32.5 in males and more than 31.0 in females; from *Mustela frenata*, in regions where the 2 species occur together, by tail less than 44 per cent of length of head and body and by postglenoidal length of skull more than 46 per cent of condylobasal length in males and more than 48 per cent in females.

The ermine is white in winter (tip of tail always black) except in the humid area along the Pacific Coast from southern British Columbia southward where the winter coat is slightly paler brown than the summer coat.

Map 463. *Mustela erminea.*

1. *M. e. alascensis*
2. *M. e. anguinae*
3. *M. e. arctica*
4. *M. e. bangsi*
5. *M. e. celenda*
6. *M. e. cicognanii*
7. *M. e. fallenda*
8. *M. e. gulosa*
9. *M. e. haidarum*
10. *M. e. initis*
11. *M. e. invicta*
12. *M. e. kadiacensis*
13. *M. e. muricus*
14. *M. e. olympica*
15. *M. e. polaris*
16. *M. e. richardsonii*
17. *M. e. salva*
18. *M. e. seclusa*
19. *M. e. semplei*
20. *M. e. streatori*

Mustela erminea alascensis (Merriam)

1896. *Putorius richardsoni alascensis* Merriam, N. Amer. Fauna, 11:12, June 30, type from Juneau, Alaska.
1944. *Mustela erminea alascensis*, Hall, Proc. Biol. Soc. Washington, 57:36, June 28.

MARGINAL RECORDS.—Alaska (Hall, 1951e:135): Taku River; type locality; Caroll Inlet, Revillagigedo Island; Loring, thence northward along coast including Mitkof, Zarembo, and Wrangel islands, to point of beginning.

Mustela erminea anguinae Hall

1932. *Mustela cicognanii anguinae* Hall, Univ. California Publ. Zool., 38:417, November 8, type from French Creek, Vancouver Island, British Columbia. Occurring naturally,

so far as known, only on Vancouver and Salt Spring islands, but introduced, according to Cowan and Guiguet (Handbook No. 11, British Columbia Provincial Mus., p. 310, July 15, 1956) on North Pender Island, British Columbia.

1945. *Mustela erminea anguinae* Hall, Jour. Mamm., 26: 79, February 27.

Mustela erminea arctica (Merriam)

1896. *Putorius arcticus* Merriam, N. Amer. Fauna, 11:15, June 30, type from Point Barrow, Alaska.

1935. *Mustela erminea arctica*, Ognev, The mammals of the U.S.S.R. and adjacent countries, 3:31.

1904. *Putorius audax* Barrett-Hamilton, Ann. Mag. Nat. Hist., ser. 7, 13:392, May, type from Discovery Bay, Ellesmere Island.

MARGINAL RECORDS (Hall, 1951e:102).—Franklin: Cape Sheridan; Bedford Pims Island; Craig Harbor. Keewatin: Franklin Isthmus. Mackenzie: Clinton Colden; Arctic Red River. Yukon: McMillan River Forks; head Lake Lebarge. Alaska: Glacier Bay; thence along coast to Unimak Island, thence northward along coast, including Arctic islands, to point of beginning.

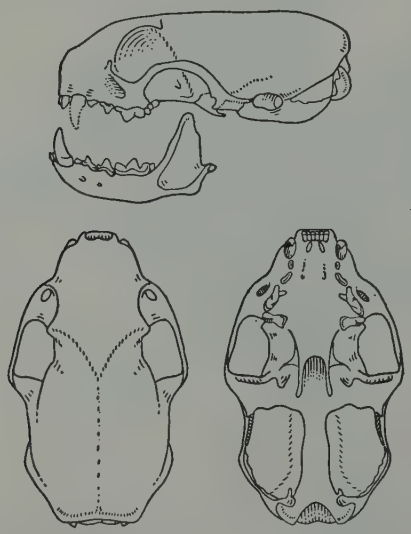


Fig. 486. *Mustela erminea arctica*, SE end of Lake Peters, long. 145° 09′ 26″ W, lat. 69° 20′ 50″ N, Romanzof Mts., Alaska, No. 51551 K.U., ♂, X 1.

Mustela erminea bangsi Hall

1945. *Mustela erminea bangsi* Hall, Jour. Mamm., 26:176, July 19, type from Elk River, Sherburne Co., Minnesota.

MARGINAL RECORDS (Hall, 1951e:127).—Manitoba: Aweme; Red River Settlement. Minnesota: Burnside Lake. Michigan: Tobin Harbor, Isle Royal; Sault Ste. Marie; Ann Arbor. Wisconsin: Beaver Dam. Iowa: Dewey's Pasture near Ruthven. North Dakota: Brantford.

Mustela erminea celenda Hall

1944. *Mustela erminea celenda* Hall, Proc. Biol. Soc. Washington, 57:38, June 28, type from Kasaan Bay, Prince of Wales Island, Alaska.

MARGINAL RECORDS.—Alaska (Hall, 1951e:141): Craig, Prince of Wales Island; type locality; Howkan, Long Island; Otter Harbor, Dall Island.

Mustela erminea cicognanii Bonaparte

1838. *Mustela cigognanii* [*sic*] Bonaparte, Charlesworth's Mag. Nat. Hist., 2:37. Type locality, eastern United States.

1945. *M[ustela]. e[rminea]. cicognanii*, Hall, Jour. Mamm., 26:77, February 27.

1842. *Mustela pusilla* DeKay, Zoology of New York . . . , Pt. 1, Mammalia, p. 34, pl. 14, fig. 1, type from New York State.

MARGINAL RECORDS (Hall, 1951e:123–124, unless otherwise noted).—Ontario: Grand Bay, Lake Nipigon; Franz; Smoky Falls near Kapuskasing. Quebec: Kiamika Lake; Black Lake. Maine: Quimby; Lincoln; Naskeag, thence south along coast to Rhode Island: Middletown. Connecticut: Liberty Hill. Maryland: 4 mi. NW Bethesda (Vasguez, 1956:113). Pennsylvania: North Shenango Township, Pymatuning Swamp, thence NE along shore of Lake Erie, down NW shore of same to Lake Huron and along northern shores of lakes Huron and Superior to Ontario: 20 mi. SW Fort Williams; Oscar.

Mustela erminea fallenda Hall

1945. *Mustela erminea fallenda* Hall, Jour. Mamm., 26:79, February 27, type from Huntingdon, British Columbia.

MARGINAL RECORDS (Hall, 1951e:153).—British Columbia: Horseshoe Lake, Stillwater; Thurstons Ranch; Tami Hy Creek. Washington: Morovitz Guard Station, 831 ft.; *Lake Whatcom.*

Mustela erminea gulosa Hall

1945. *Mustela erminea gulosa* Hall, Jour. Mamm., 26:84, February 27, type from Trout Lake, Klickitat Co., Washington.

MARGINAL RECORDS.—Washington (Hall, 1951e: 161): 2 mi. E Skykomish; *Easton*; type locality; *Mt. St. Helens, 6000 ft.*; Meslers Ranch, 2000 ft., 1 mi. W Rainier Park.

Mustela erminea haidarum (Preble)

1898. *Putorius haidarum* Preble, Proc. Biol. Soc. Washington, 12:169, August 10, type from Massett, Graham Island, Queen Charlotte Islands, British Columbia.

1944. *Mustela erminea haidarum*, Hall, Proc. Biol. Soc. Washington, 57:38, June 28.

MARGINAL RECORDS (Hall, 1951e:145).—British Columbia: type locality; Skidgate, Graham Island; Cumsheva Inlet, Moresby Island.

Mustela erminea initis Hall

1944. *Mustela erminea initis* Hall, Proc. Biol. Soc. Washington, 57:37, June 28, type from Saook Bay, Baranof Island, Alaska.

MARGINAL RECORDS.—Alaska (Hall, 1951e:139): Freshwater Bay, Chichagof Island; type locality, Baranof Island.

Mustela erminea invicta Hall

1945. *Mustela erminea invicta* Hall, Jour. Mamm., 26:75, February 27, type from Benewah, Benewah Co., Idaho.

MARGINAL RECORDS (Hall, 1951e:131).—Alberta: Jasper House; forks of Blindman River and Red Deer River. Montana: Duck Lake, 6 mi. NE St. Marys Lake; Darby; *Tin Cup District.* Idaho: Sawmill Creek, 1¼ mi. W Newsome; *14 mi. W Iron Mtn.*; type locality. Washington: Lake Chelan; *Twin Lakes, Winchester Mts.* British Columbia: Chilliwack Lake; Wentworth Lake. Alberta: *Shovel Pass.*

Mustela erminea kadiacensis (Merriam)

1896. [*Putorius arcticus*] subspecies *kadiacensis*, Merriam, N. Amer. Fauna, 11:16, June 30, type from Kodiak Island, Alaska.
1945. *Mustela erminea kadiacensis*, Hall, Jour. Mamm., 26: 179, July 19.

MARGINAL RECORDS (Hall, 1951e:110).—Alaska (Kodiak Island): Kodiak; Karluk, and presumably over entire island.

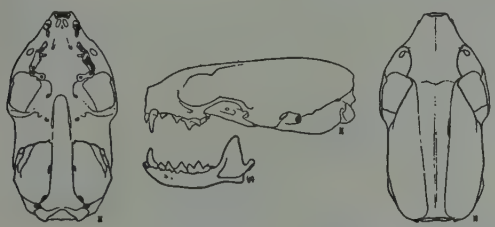


Fig. 487. *Mustela erminea muricus*, Baker Creek, White Pine Co., Nevada, No. 41501 M.V.Z., ♂, X 1.

Mustela erminea muricus (Bangs)

1899. *Putorius* (*Arctogale*) *muricus* Bangs, Proc. New England Zool. Club, 1:71, July 31, type from Echo, 7500 ft., El Dorado Co., California.
1945. *Mustela erminea murica*, Hall, Univ. Kansas Publ., Mus. Nat. Hist., 26:84, February 27.
1903. *Putorius streatori leptus* Merriam, Proc. Biol. Soc. Washington, 16:76, May 29, type from Silverton, San Juan Co., Colorado.

MARGINAL RECORDS (Hall, 1951e:164–165, unless otherwise noted).—Montana: Camas Creek, Big Belt Mts., 4 mi. S Fort Logan. Wyoming: 5 mi. NW Sundance, 5900 ft. South Dakota: 4 mi. SE Hill City, 5300 ft.; *½ mi. E Sylvan Lake, 6250 ft.* Wyoming: 30 mi. N, 10 mi. E Laramie, 6560 ft. Colorado: Denver; Turkey Creek, SW of Colorado Springs, 6000 ft. New Mexico: *Twining, 10,700 ft.*; saddle S of Santa Fe Baldy, 11,000 ft.; 9 mi. E Cuba, 9000 ft. Utah: Wildcat Ranger Station, Boulder Mtn., 8700 ft. (Durrant, 1952:417). Nevada: Baker Creek, 8500–11,100 ft.; South Twin River, Toyabe Mts.; ½ mi. S Marlette Lake, 8150 ft. California: Mammoth; *Vogelsang Lake, 10,350 ft., Yosemite Park; Echo; Fallen Leaf Lake, 6500 ft.; 2 mi. W Black Butte, 6800 ft.; Castle Lake, 5434 ft.*; head of Rush Creek, 6400 ft. Oregon: Fort Klamath; Mill Creek, 20 mi. W Warmsprings. Washington: Stayawhile Spring, 5150 ft.; *Butte Creek.* Idaho: W. Fork Rapid Creek, 9½ mi. E Pocatello. Montana: Donovan.

Mustela erminea olympica Hall

1945. *Mustela erminea olympica* Hall, Jour. Mamm., 26: 81, February 27, type from near head of Soleduck River, 4500 ft., Olympic Mts., Clallam Co., Washington.

MARGINAL RECORDS.—Washington (Hall, 1951e: 155): Clallam Bay, thence east and south along coast to: 4 mi. S Olympia, thence west to coast and north up coast to point of beginning.

Mustela erminea polaris (Barrett-Hamilton)

1904. *Putorius arcticus polaris* Barrett-Hamilton, Ann. Mag. Nat. Hist., ser. 7, 13:393, May, type from Gap Valley, 7¼ mi. NE Cape Brevoort, lat. 82° N, long. 59° 20′ W, northwestern Greenland.
1945. *Mustela erminea polaris*, Hall, Jour. Mamm., 26:179, July 19.

MARGINAL RECORDS.—Greenland (Hall, 1951e:105): Dragon Point south on east coast to Turner Sund and on west coast to type locality.

Mustela erminea richardsonii Bonaparte

1838. *Mustela Richardsonii* Bonaparte, Charlesworth's Mag. Nat. Hist., 2:38, January. Type locality, probably Fort Franklin, Canada.
1945. *Mustela ermina richardsonii*, Hall, Jour. Mamm., 26: 77, February 27.
1903. *Putorius microtis*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:563, October 10, type from Shesley, British Columbia.
1904. *Putorius arcticus imperii* Barrett-Hamilton, Ann. Mag. Nat. Hist., ser. 7, 13:392, May, type from Fort Simpson, Mackenzie.
1913. *Mustela cicognanii mortigena* Bangs, Bull. Mus. Comp. Zool., 54:511, July, type from Bay St. George, Newfoundland.

MARGINAL RECORDS (Hall, 1951e:117–118, unless otherwise noted).—Mackenzie: Fort Goodhope (*op. cit.*: 102). Keewatin: foot of Baker Lake. Manitoba: Egg Island, Rabbit Point, south, thence east and thence north along the shores of Hudson Bay, including in Quebec: Charlton Island; Belcher Islands; Fort Chimo. Labrador: Okak, thence southward along coast including Newfoundland, to New Brunswick: Scotch Lake; Red Brook, Tobique River. Quebec: Godbout; Waswonaby Post. Ontario: Abitibi. Manitoba: Lake St. Martin. Saskatchewan: Indianhead; Livelong. Alberta: Entrance. British Columbia: Isaacs Lake; Horse Lake; McGillivary Creek; Mons; Port Simpson; Shesley. Yukon: 30 mi. N Teslin Lake.

Mustela erminea salva Hall

1944. *Mustela erminea salva* Hall, Proc. Biol. Soc. Washington, 57:35, June 28, type from Mole Harbor, Admiralty Island, Alaska.

MARGINAL RECORDS (Hall, 1951e:136).—Alaska (Admiralty Island): Hawk Inlet; Seymour Canal; *type locality; Gambier Bay.*

Mustela erminea seclusa Hall

1944. *Mustela erminea seclusa* Hall, Proc. Biol. Soc. Washington, 57:39, June 28, type from Port Santa Cruz, Suemez Island, Alaska. Known only from the type locality.

Mustela erminea semplei Sutton and Hamilton

1932. *Mustela arctica semplei* Sutton and Hamilton, Ann. Carnegie Mus., 21:79, February 13, type from Coral Inlet, South Bay, Southampton Island, Keewatin.
1945. *Mustela erminea semplei,* Hall, Jour. Mamm., 26: 179, July 19.
1935. *Mustela arctica labiata* Degerbøl, Rept. 5th Thule Exped., 2(no. 4):25, type from Malugsitaq, Melville Peninsula, Franklin.

MARGINAL RECORDS (Hall, 1951e:108, unless otherwise noted).—Franklin: Bylot Island (R. S. Miller, 1955: 169); Ponds Inlet; Kingnait Fiord; SW coast of Baffinland; Cape Dorset. Keewatin: Ranger Rim, Southampton Island; Eskimo Point; Rae Isthmus.

Mustela erminea streatori (Merriam)

1896. *Putorius streatori* Merriam, N. Amer. Fauna, 11:13, June 30, type from Mount Vernon, Skagit Valley, Skagit Co., Washington.
1945. *Mustela erminea streatori,* Hall, Jour. Mamm., 26:77, February 27.

MARGINAL RECORDS (Hall, 1951e:158).—Washington: N end Whidby Island, opposite Deception Pass; Oso, 550 ft.; *Hamilton*; 15 mi. N Gov't Springs, 1300 ft. Oregon: Deschutes River, 6 mi. E Crescent Lake. California: 10 mi. NE Carlotta; mouth Gualala River, thence northward along coast to Washington: Wallicut, 2 mi. E Ilwaco, thence to south end Puget Sound and north along east shore of Puget Sound to and including Whidby Island.

Mustela rixosa
Least Weasel

Total length less than 250 in males and 225 in females; tail a fourth or less of head and body and without black pencil (or at most with few black hairs at extreme tip); caudal vertebrae 11–16; basilar length (30.7) of longest skull less than in shortest skull of *M. frenata* and same is true in comparison with *M. erminea* in areas where *M. rixosa* and *M. erminea* occur together. (SW of range of *M. rixosa*, basilar length is less than 30.7 in some *M. erminea.*)

In skulls of equal size, the mastoid breadth in *M. rixosa* equals or exceeds the greatest breadth of the braincase, whereas the reverse is ordinarily true in subspecies of *M. erminea* that are as small as *M. rixosa.* In summer, brown above and white below; in the southeastern part of the range of the species some individuals are brown in winter and are brown on most of the underparts as well as on the upper parts, but elsewhere in North America are white in winter.

Mustela rixosa allegheniensis (Rhoads)

1901. *Putorius allegheniensis* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 52:751, March 25, type from near Beallsville, Washington Co., Pennsylvania.
1926. *Mustela rixosa allegheniensis,* Swenk, Jour. Mamm., 7:328, November 23.

MARGINAL RECORDS (Hall, 1951e:190, unless otherwise noted).—Michigan: Osceola County (Burt, 1946:138); 8 mi. N Caro; *Deckerville,* thence along southern shore of Lake Erie to Pennsylvania: McKeen Township; North Mahoning Township; Middle Paxton Township. Virginia: near Dayton (Llewellyn, 1942:440); Blacksburg (*ibid.*). North Carolina: near Marshall: Ohio: Vinton; *5 mi. SW Mt. Orab* (Hoffmeister, 1956d:195–196); 6 mi. NNW New Richmond (*ibid.*). Illinois: Urbana (Hoffmeister, *ibid.*); Henkel (*ibid.*). Wisconsin: Sumpter Township; Beaver Dam.

Mustela rixosa campestris Jackson

1913. *Mustela campestris* Jackson, Proc. Biol. Soc. Washington, 26:124, May 21, type from Beemer, Cuming Co., Nebraska.
1926. *Mustela rixosa campestris,* Swenk, Jour. Mamm., 7:329, November 23.

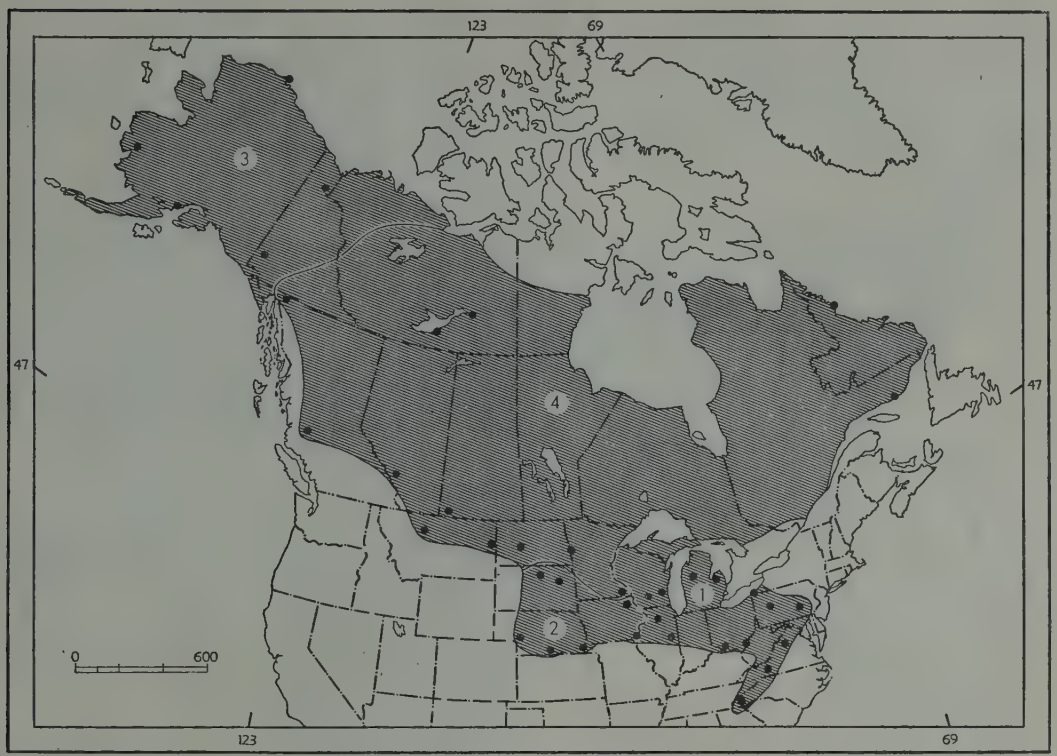
MARGINAL RECORDS (Hall, 1951e:192, unless otherwise noted).—South Dakota: shore of Sand Lake, s. 15, T. 126N, R. 62W; Waubay Migratory Waterfowl Refuge. Iowa: Chester; *National*; Mount Pleasant. Nebraska: Clatonia (Velich, 1956:272); Inland; *Hastings* (Jones, 1954: 486); Oshkosh (Swenk, 1926:321).

Mustela rixosa eskimo (Stone)

1900. *Putorius rixosus eskimo* Stone, Proc. Acad. Nat. Sci. Philadelphia, 52:44, March 24, type from Point Barrow, Alaska.
1912. *Mustela rixosa eskimo,* Miller, Bull. U.S. Nat. Mus., 79:96, December 31.

MARGINAL RECORDS (Hall, 1951e:183).—Alaska: Point Barrow, thence east along coast for undetermined distance and south to Yukon: La Pierres House; Klotassin River, tributary of White River. Alaska: Tyoonok [= Tyonek]; Bethel, and along coast to point of beginning.

Fig. 488. *Mustela rixosa rixosa,* Jadis, Roseau Co., Minnesota, No. 48005 K.U., subadult, probably ♂. X 1.



Map 464. *Mustela rixosa.*

1. *M. r. allegheniensis* 2. *M. r. campestris* 3. *M. r. eskimo* 4. *M. r. rixosa*

Mustela rixosa rixosa (Bangs)

1896. *Putorius rixosus* Bangs, Proc. Biol. Soc. Washington, 10:21, February 25, type from Osler, Saskatchewan.
1912. *Mustela rixosa rixosa*, Miller, Bull. U.S. Nat. Mus., 79: 96, December 31.

MARGINAL RECORDS (Hall, 1951e:186–187).—Mackenzie: Old Fort Reliance. Labrador: Davis Inlet, south along coast to Quebec: Natashkwan, thence along coast, St. Lawrence River, Ottawa River and north shores of lakes Huron and Superior to Minnesota: Crystal Springs; Moorhead. North Dakota: Mandan. Montana: Wibaux. Saskatchewan: Eastend. Montana: Sun River Valley. Alberta: Miette River. British Columbia: Wistaria P.O.; 15 mi. E Atlin. Mackenzie: Fort Resolution.

Mustela frenata
Long-tailed Weasel

Total length, 300–550; tail two-fifths to seven-tenths of length of head and body, with distinct black pencil at end; caudal vertebrae 19–23; post-glenoidal length, expressed as percentage of condylobasal length, less than 47 in females and ordinarily less than 46 in males; upper parts brown; light-colored underparts, in summer pelage, tinged with buffy or yellowish and continuous from chin to inguinal region; some subspecies (southwestern United States, Mexico, Central America, and Florida) with white or yellowish facial markings, which do not occur in any other American species of the genus *Mustela*. Northern subspecies are white in winter; the other subspecies are only a lighter shade of brown than in summer; tip of the tail at all times black. The black tip on the tail is shorter in relation to the length of the tail than in most subspecies of *M. erminea*; other differences from *M. erminea* and *M. rixosa* are given in the accounts of those species.

There is only one litter per year and mating occurs in July and August. Young are born in April

and May. Embryos are implanted only 21 to 28 days before the young are born, and in the preceding part of the long gestation period (205–337 days) the embryos lie dormant in the uterus as unimplanted blastocysts. Females mate when 3 to 4 months old but males are not sexually mature until almost a year old.

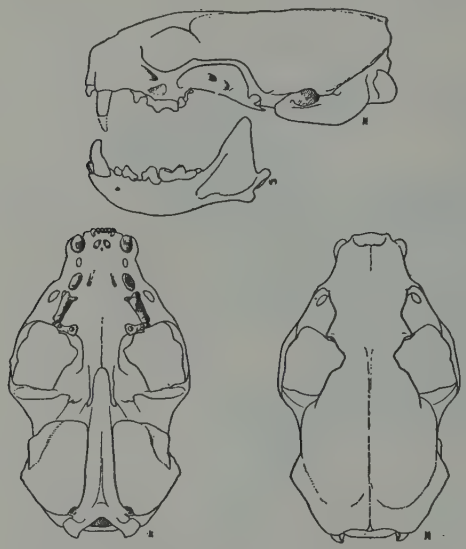


Fig. 489. *Mustela frenata nevadensis*, Baker Creek, White Pine Co., 8400 ft., Nevada, No. 41508 M.V.Z., ♂, X 1.

Mustela frenata alleni Merriam

1896. *Putorius alleni* Merriam, N. Amer. Fauna, 11:24, June 30, type from Custer, Custer Co., South Dakota.
1936. *Mustela frenata alleni*, Hall, Carnegie Inst. Washington Publ. 473:106, November 20.

MARGINAL RECORDS (Hall, 1951e:276).—Wyoming: Sundance. South Dakota: Hill City; type locality. Nebraska: Mitchell. South Dakota: *20 mi. N Elk Mountain.*

Mustela frenata altifrontalis Hall

1936. *Mustela frenata altifrontalis* Hall, Carnegie Inst. Washington Publ. 473:94, November 20, type from Tillamook, Tillamook Co., Oregon.

MARGINAL RECORDS (Hall, 1951e:304).—British Columbia: Chilliwack; *Lihumption Park, 4750 ft.* Washington: *Swamp Creek, 2050 ft., Nooksack River*; Tye; Auburn. Oregon: Blaine; Reed; Langlois, thence up coast to British Columbia: *mouth of Fraser River.*

Mustela frenata arizonensis (Mearns)

1891. *Putorius arizonensis* Mearns, Bull. Amer. Mus. Nat. Hist., 3:234, June 5, type from San Francisco Forest [then (1886?) Yavapai Co.], Arizona.
1936. *Mustela frenata arizonensis*, Hall, Carnegie Inst. Washington Publ. 473:106, November 20.

MARGINAL RECORDS (Hall, 1951e:280).—Arizona: V. T. Park; Deadman Flat, 6400 ft.; Springerville. New Mexico: Willow Creek, 8500 ft., Mogollon Mts. Arizona: Prieto Plateau, 9000 ft., S end Blue Range; Quaking Asp Settlement; Government Prairie, near Parks.

Mustela frenata arthuri Hall

1927. *Mustela noveboracensis arthuri* Hall, Proc. Biol. Soc. Washington, 40:193, December 2, type from Remy, St. James Parish, Louisiana.
1936. *Mustela frenata arthuri* Hall, Carnegie Inst. Washington Publ. 473:105, November 20.

MARGINAL RECORDS (Hall, 1951e:244).—Mississippi: Saucier, thence south to coast and west along coast into Texas: *3 mi. S Garwood*; 5 mi. W Eagle Lake; *12 mi. N Eagle Lake.* Louisiana: Baton Rouge.

Mustela frenata costaricensis Goldman

1912. *Mustela costaricensis* Goldman, Proc. Biol. Soc. Washington, 25:9, January 23, type from San José, Costa Rica.
1936. *Mustela frenata costaricensis*, Hall, Carnegie Inst. Washington Publ. 473:109, November 20.

MARGINAL RECORDS.—Costa Rica (Hall, 1951e:375): [Volcán] Irazú, 3000 m.; *Tucurrique; Muñeco; Candelaria Mts.; type locality.*

Mustela frenata effera Hall

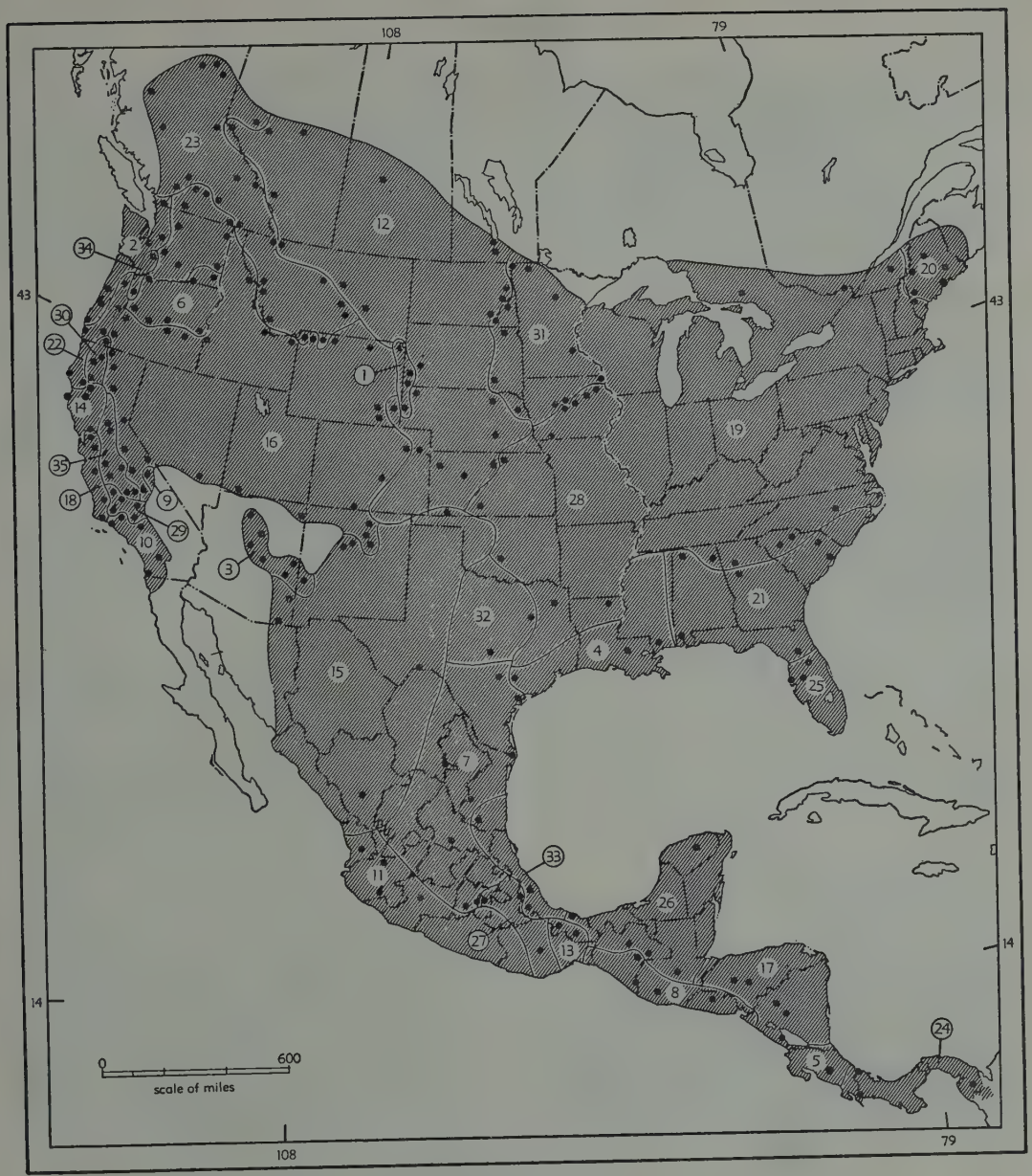
1936. *Mustela frenata effera* Hall, Carnegie Inst. Washington Publ. 473:93, November 20, type from Ironside, 4000 ft., Malheur Co., Oregon.

MARGINAL RECORDS (Hall, 1951e:293–294).—Washington: Asotin. Oregon: 1½ mi. S Vale; 25 mi. NW Burns; Fort Rock; Sisters; 4 mi. S The Dalles thence eastward along Columbia River to Washington: Wallula, thence *Prescott.*

Mustela frenata frenata Lichtenstein

1831. *Mustela frenata* Lichtenstein, Darstellung neuer oder wenig bekannter Säugethiere . . . , pl. 42 and corresponding text, unpaged, type from Ciudad México, México.
1813. *Mustela brasiliensis* Sevastianoff, Mem. de l'acad. Imp. Sci. St. Pétersbourg, 4:356–363, tab. 4, name on plate only, the description being in the text. Not *Mustela brasiliensis* Gmelin, 1788, a name applied to an otter. Type locality, unknown.
1877. *Putorius mexicanus* Coues, Fur-bearing animals, U.S. Geol. Surv. Territories, Miscl. Publ., 8:42, a *nomen nudum* [cited by Coues in synonymy as "*Putorius mexicanus*, Berlandier, MMS. ic. ined. 4 (Tamaulipas and Matamoras)"].

MARGINAL RECORDS (Hall, 1951e:347, unless otherwise noted).—Texas: San Antonio; *Charco*; Corpus Christi; *Brownsville.* Tamaulipas: Matamoros; Miquihuana. Distrito Federal: Tlalpam. México: Nevada Toluca, 3200 m. San Luis Potosí: Álvarez. Coahuila: mountains near Saltillo (6375 MCZ).



Map 465. *Mustela frenata.*

Guide to subspecies

1. *M. f. alleni*
2. *M. f. altifrontalis*
3. *M. f. arizonensis*
4. *M. f. arthuri*
5. *M. f. costaricensis*
6. *M. f. effera*
7. *M. f. frenata*
8. *M. f. goldmani*
9. *M. f. inyoensis*
10. *M. f. latirostra*
11. *M. f. leucoparia*
12. *M. f. longicauda*
13. *M. f. macrophonius*
14. *M. f. munda*
15. *M. f. neomexicana*
16. *M. f. nevadensis*
17. *M. f. nicaraguae*
18. *M. f. nigriauris*
19. *M. f. noveboracensis*
20. *M. f. occisor*
21. *M. f. olivacea*
22. *M. f. oregonensis*
23. *M. f. oribasus*
24. *M. f. panamensis*
25. *M. f. peninsulae*
26. *M. f. perda*
27. *M. f. perotae*
28. *M. f. primulina*
29. *M. f. pulchra*
30. *M. f. saturata*
31. *M. f. spadix*
32. *M. f. texensis*
33. *M. f. tropicalis*
34. *M. f. washingtoni*
35. *M. f. xanthogenys*

Mustela frenata goldmani (Merriam)

1896. *Putorius frenatus goldmani* Merriam, N. Amer. Fauna, 11:28, June 30, type from Pinabete, Chiapas.
1912. *Mustela frenata goldmani,* Miller, Bull. U.S. Nat. Mus., 79:100, December 31.

MARGINAL RECORDS (Hall, 1951e:360).—Chiapas: 20 mi. SE Teopisca. El Salvador: Los Esesmiles, 8000 ft.; *La Cebia, 2150 ft.* Guatemala: Finca San Isidro, San Sebastión. Chiapas: type locality.

Mustela frenata inyoensis Hall

1936. *Mustela frenata inyoensis* Hall, Carnegie Inst. Washington Publ. 473:99, November 20, type from Carl Walter's Ranch, 2 mi. N Independence, Inyo Co., California.

MARGINAL RECORDS.—California (Hall, 1951e:333): Alvord, 4000 ft.; *Lone Pine; type locality.*

Mustela frenata latirostra Hall

1936. *Mustela frenata latirostra* Hall, Carnegie Inst. Washington Publ. 473:96, November 20, type from San Diego, San Diego Co., California.

MARGINAL RECORDS.—California (Hall, 1951e:327): Cuyama Valley, 2200 ft.; Bluff Lake; *Cabazon;* Julian; Chula Vista, thence N at least to Rincon Point.

Mustela frenata leucoparia (Merriam)

1896. *Putorius frenatus leucoparia* Merriam, N. Amer. Fauna, 11:29, June 30, type from Pátzcuaro, Michoacán.
1912. *Mustela frenata leucoparia,* Miller, Bull. U.S. Nat. Mus., 79:100, December 31.

MARGINAL RECORDS (Hall, 1951e:351).—Nayarit: Tepic. Jalisco: Río Santiago. Michoacán: type locality. Jalisco: Los Masos.

Mustela frenata longicauda Bonaparte

1938. *Mustela longicauda* Bonaparte, Charlesworth's Mag. Nat. Hist., 2:38, January. Type locality, possibly Carlton House, Saskatchewan.
1936. *Mustela frenata longicauda,* Hall, Carnegie Inst. Washington Publ. 473:105, November 20.

MARGINAL RECORDS (Hall, 1951e:269).—Alberta: Saint Albert. Saskatchewan: Wingard. Manitoba: Portage la Prairie; Carman. North Dakota: Grafton; Larimore; Valley City. Nebraska: Neligh; Inland. Kansas: Glasco; Trego County; near Brewster. Colorado: Wray. Wyoming: Fort Laramie. Nebraska: Chadron. South Dakota: Rapid City. Montana: ¾ mi. N Ingomar; 5 mi. NW Hilger; St. Marys Lake. Alberta: *Waterton Lake Park;* Canmore; Moose Pass; Islay.

Mustela frenata macrophonius (Elliot)

1905. *Putorius macrophonius* Elliot, Proc. Biol. Soc. Washington, 18:235, December 9, type from Achotal, Veracruz.
1936. *Mustela frenata macrophonius,* Hall, Carnegie Inst. Washington Publ. 473:109, November 20.

MARGINAL RECORDS.—Veracruz (Hall, 1951e:363): type locality; Pérez.

Mustela frenata munda (Bangs)

1899. *Putorius xanthogenys mundus* Bangs, Proc. New England Zool. Club, 1:56, June 9, type from Point Reyes, Marin Co., California.
1936. *Mustela frenata munda,* Hall, Carnegie Inst. Washington Publ. 473:107, November 20.

MARGINAL RECORDS.—California (Hall, 1951e:315): S Yolla Bolly Mt.; Mt. Sanhedrin; 4 mi. N Vallejo, thence W along Carquinez Straits and San Francisco Bay, thence N along coast at least to Fort Bragg; probably up coast to 40° N, thence to point of beginning.

Mustela frenata neomexicana (Barber and Cockerell)

1898. *Putorius frenatus neomexicanus* Barber and Cockerell, Proc. Acad. Nat. Sci. Philadelphia, 50:188, May 3, type from Armstrongs Lake, Mesilla, Dona Ana Co., New Mexico.
1912. *Mustela frenata neomexicana,* Miller, Bull. U.S. Nat. Mus., 79:100, December 31.

MARGINAL RECORDS (Hall, 1951e:338, unless otherwise noted).—Kansas: Liberal. Texas: Lozier. Durango: Durango (city of). Arizona: Tombstone; Safford. New Mexico: 3 mi. NW Albuquerque; 11 mi. SW Santa Fe (Holdenried and Morlan, 1956:379).

Mustela frenata nevadensis Hall

1936. *Mustela frenata nevadensis* Hall, Carnegie Inst. Washington Publ. 473:91, November 20, type from 3 mi. E Baker, White Pine Co., Nevada.

MARGINAL RECORDS (Hall, 1951e:288–291).—British Columbia: Monte Creek, 20 mi. E Kamloops; Sicamous; *Monashee Pass;* Nelson. Washington: Ione. Idaho: Lochsa River [Locksaw Fork]; Leadore; Dry Creek, Targee National Forest. Wyoming: Lamar River, Yellowstone National Park; Greybull River; Buffalo; Garrett; near Laramie. Colorado: 6 mi. NE Hillrose; Colorado Springs, 6000 ft.; Osier. New Mexico: 2 mi. N Twining, 10,500 ft.; Pecos Baldy, 11,600 ft.; Ribera. Arizona: 15 mi. E Luka Chu Kai Navajo School, 8000 ft. Utah: St. George. Nevada: 3 mi. S Crystal Spring, 3900 ft., Pahranagat Valley. California: 10,300 ft., near Big Prospector Meadow; *Little Onion Valley, 7500 ft.;* Quaking Aspen Meadow, 7500 ft.; *E Fork Kaweah River, 9800 ft.;* Hume; Merced Grove, Big Trees, 5400 ft.; Blue Canyon, 5000 ft.; Dale's, 600 ft., on Paines Creek; Mt. Shasta; Hornbrook. Oregon: Rustler Peak, Crater National Forest; *Anna Creek, Mt. Mazama;* 20 mi. W Crescent; Burns; 2 mi. NW Riverside. Idaho: 2 mi. S Payette, thence along Snake River to Washington: Snake River; 1 mi. W Moxee; Easton; Barron, 5000 ft. British Columbia: Hope-Princeton Summit, 5600 ft.

Mustela frenata nicaraguae J. A. Allen

1916. *Mustela tropicalis nicaraguae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 35:100, April 28, type from Matagalpa, Nicaragua.
1936. *Mustela frenata nicaraguae,* Hall, Carnegie Inst. Washington Publ. 473:109, November 20.

MARGINAL RECORDS (Hall, 1951e:372).—Honduras: Cerro Grande La Paz; La Flor Archaga. Nicaragua: San Rafael del Norte; type locality; Mombacho.

Mustela frenata nigriauris Hall

1936. *Mustela frenata nigriauris* Hall, Carnegie Inst. Washington Publ. 473:95, November 20, type from 2½ mi. E Santa Cruz, Santa Cruz Co., California.

MARGINAL RECORDS.—California (Hall, 1951e:322): *Glen Frazer Station; Concord*; 7 mi. E Clayton; ¼ mi. N Milpitas; Gonzales; 5 mi. SE Santa Margarita; 5 mi. N Las Cruces, thence N along coast and S shores of San Francisco Bay to point of beginning.

Mustela frenata noveboracensis (Emmons)

1840. *Putorius Noveboracensis* Emmons, A report on the quadrupeds of Massachusetts, p. 45. Type locality, Williamstown, Berkshire Co., Massachusetts.
1936. *Mustela frenata noveboracensis*, Hall, Carnegie Inst. Washington, Publ. 473:104, November 20.
1842. *Mustela fusca* Audubon and Bachman, Jour. Acad. Nat. Sci. Philadelphia, 8(Pt. 2):288, type from state of New York.
1853. *Putorius agilis* Audubon and Bachman, The viviparous quadrupeds of North America, 3:184, pl. 140, type from state of New York. Not *Mustela agilis* Tschudi, 1844, a name applied to the weasel of Perú.
1899. *Putorius noveboracensis notius* Bangs, Proc. New England Zool. Club, 1:53, June 9, type from Weaverville, Buncombe Co., North Carolina.

MARGINAL RECORDS (Hall, 1951e:228–230).—Ontario: Metagama; Ottawa. Quebec: Black Lake. Maine: Bethel, thence along coast from southern Maine to North Carolina: Raleigh. South Carolina: 5 mi. E York; Laurens. Georgia: Roswell. Alabama: Fort Payne, west to Mississippi River, north up east bank to St. Croix River and north along Wisconsin-Minnesota boundary to Lake Superior, thence east along south shore to point of beginning.

Mustela frenata occisor (Bangs)

1899. *Putorius occisor* Bangs, Proc. New England Zool. Club, 1:54, June 9, type from Bucksport, Hancock Co., Maine.
1936. *Mustela frenata occisor*, Hall, Carnegie Inst. Washington Publ., 473:104, November 20.

MARGINAL RECORDS.—Maine (Hall, 1951e:232): Moosehead Lake; 3rd Mopang Lake; type locality; *South Andover*; Umbagog Lake; Seven Pd. Township.

Mustela frenata olivacea Howell

1913. *Mustela peninsulae olivacea* Howell, Proc. Biol. Soc. Washington, 26:139, May 21, type from Autaugaville, Autauga Co., Alabama.
1936. *Mustela frenata olivacea*, Hall, Carnegie Inst. Washington Publ. 473:104, November 20.

MARGINAL RECORDS (Hall, 1951e:250).—Alabama: 9 mi. N Tennessee River near Leighton (in Lauderdale Co.); *White Creek*. Georgia: Spalding County. South Carolina: Society Hill; Sampit, thence south along coast to Florida: Silver Springs, thence west to coast and along coast to Alabama: 12 mi. NE Mobile.

Mustela frenata oregonensis (Merriam)

1896. *Putorius xanthogenys oregonensis* Merriam, N. Amer. Fauna, 11:25, June 30, type from Grants Pass, Rogue River Valley, Josephine Co., Oregon.
1936. *Mustela frenata oregonensis*, Hall, Carnegie Inst. Washington Publ. 473:107, November 20.

MARGINAL RECORDS (Hall, 1951e:309).—Oregon: Forest Grove; McKenzie Bridge; 6 mi. S Medford. California: 12 mi. E Bridgeville; *2 mi. W Bridgeville*; Ferndale. Oregon: Goldbeach; *Buchanan*.

Mustela frenata oribasus (Bangs)

1899. *Putorius (Arctogale) longicauda oribasus* Bangs, Proc. New England Zool. Club, 1:81, December 27, type from source of Kettle River, 7500 ft., on the summit between middle fork of Kettle River and Cherry Creek at Pinnacles, British Columbia.
1936. *Mustela frenata oribasa*, Hall, Carnegie Inst. Washington Publ. 473:105, November 20.

MARGINAL RECORDS (Hall, 1951e:274).—British Columbia: west of Hudson Hope; Little Prairie. Alberta: Thoral Creek, 7000 ft., 50 mi. NE Jasper. British Columbia: Isaacs Lake, 3200 ft.; E side Beaverfoot Range, 4000 to 4500 ft., between Fraser Creek and 6 mi. SE of Fraser Creek; head of Cross River 10 mi. below Assiniboine Pass. Montana: Chief Mtn. Lake; Highwood Mts.; Big Snowy Mts.; Tacy. Wyoming: Four Bears; Glen Creek, Mammoth Hot Springs. Montana: Donovan; Tin Cup District; Florence. British Columbia: Camp E of Kootanie River; type locality; Lillooet; Alta Lake; Chezacut; Wistaria; Clearwater River, tributary to Peace River.

Mustela frenata panamensis Hall

1932. *Mustela frenata panamensis* Hall, Proc. Biol. Soc. Washington, 45:139, September 9, type from Río Indio, Canal Zone, near Gatún, Panamá.

MARGINAL RECORDS—Panamá (Hall, 1951e:379): Siola [= Sixola?] and Río Gariché, 5300 ft., eastward at least to Mt. Pirre.

Mustela frenata peninsulae (Rhoads)

1894. *Putorius peninsulae* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 46:152, June 19, type from Hudson's [14 mi. N Tarpon Springs], Pasco Co., Florida.
1936. *Mustela frenata peninsulae*, Hall, Carnegie Inst. Washington Publ. 473:105, November 20.

MARGINAL RECORDS.—Florida (Hall, 1951e:252): Enterprise; *Osceola*; Auburndale; Tarpon Springs; *Hernando County*.

Mustela frenata perda (Merriam)

1902. *Putorius tropicalis perdus* Merriam, Proc. Biol. Soc. Washington, 15:67, March 22, type from Teapa, Tabasco.
1936. *Mustela frenata perda*, Hall, Carnegie Inst. Washington Publ. 473:109, November 20.

MARGINAL RECORDS (Hall, 1951e:369).—Yucatan: Chichén-Itzá. Guatemala: *Cobán*; Finca la Providenci, S Cristóbal, Verapaz. Chiapas: San Vicente; San Cristóbal. Veracruz: Catemaco.

Mustela frenata perotae Hall

1936. *Mustela frenata perotae* Hall, Carnegie Inst. Washington Publ. 473:100, November 20, type from 12,500 ft., Cofre de Perote, Veracruz.

MARGINAL RECORDS (Hall, 1951e:355).—México: Monte Río Frío, 45 km. ESE Mexico City. Veracruz: type locality. Oaxaca: Cerro San Felipe, 10,000 ft.

Mustela frenata primulina Jackson

1913. *Mustela primulina* Jackson, Proc. Biol. Soc. Washington, 26:123, May 21, type from 5 mi. NE Avilla, Jasper Co., Missouri.
1936. *Mustela frenata primulina*, Hall, Carnegie Inst. Washington Publ. 473:104, November 20.

MARGINAL RECORDS (Hall, 1951e:240).—Iowa: Fayette, thence east to Mississippi River and down west bank to Louisiana: Swartz. Texas: 10 mi. S Sulphur Springs. Oklahoma: Norman. Kansas: Pratt; near Winkler. Iowa: Taylor County; *sec. 21, Worth Township in Boone County*; 2 mi. E Ledges State Park; Union; New Hartford.

Mustela frenata pulchra Hall

1936. *Mustela frenata pulchra* Hall, Carnegie Inst. Washington Publ. 473:98, November 20, type from Buttonwillow, Kern Co., California.

MARGINAL RECORDS.—California (Hall, 1951e:331): Coalinga; *4 mi. E Coalinga*; Alila [= Earlimart]; Isabella; Willow Spring; 2 mi SW Simmler; *3 mi. S Coalinga*.

Mustela frenata saturata (Merriam)

1896. *Putorius saturatus* Merriam, N. Amer. Fauna, 11:21, June 30, type from Siskiyou, Jackson Co., Oregon.
1936. *Mustela frenata saturata*, Hall, Carnegie Inst. Washington Publ. 473:106, November 20.

MARGINAL RECORDS (Hall, 1951e:300).—Oregon: Mt. Ashland; *Siskiyou*. California: Jackson Lake, 5900 ft.; South Fork Mtn., 5500 ft.; summit E of Hoopa, 5800 ft.

Mustela frenata spadix (Bangs)

1896. *Putorius longicauda spadix* Bangs, Proc. Biol. Soc. Washington, 10:8, February 25, type from Fort Snelling, Hennepin Co., Minnesota.
1936. *Mustela frenata spadix*, Hall, Carnegie Inst. Washington Publ. 473:105, November 20.

MARGINAL RECORDS (Hall, 1951e:262).—Minnesota: Kittson County; 2¾ mi. SW Roseau; Itasca County, T. 61N, R. 26 W; type locality. Iowa: Lansing; Ames; *sec. 19 in Amaqua Township of Boone County*; Pilot Mound. Nebraska: Beemer. South Dakota: Armour; Fort Sisseton. North Dakota: Oakes; Casselton.

Mustela frenata texensis Hall

1936. *Mustela frenata texensis* Hall, Carnegie Inst. Washington Publ. 473:99, November 20, type from Kerr Co., Texas.

MARGINAL RECORDS.—Texas (Hall, 1951e:340): Erath; *5 mi. N Waco*; Kerr County; *Fredericksburg*.

Mustela frenata tropicalis (Merriam)

1896. *Putorius tropicalis* Merriam, N. Amer. Fauna, 11:30, June 30, type from Jico, Veracruz.
1936. *Mustela frenata tropicalis*, Hall, Carnegie Inst. Washington Publ. 473:109, November 20.

MARGINAL RECORDS (Hall, 1951e:366).—Tamaulipas: 50 mi. S Victoria. Veracruz: 5 km. N Jalapa; *Jalapa*; Orizaba; *type locality*.

Mustela frenata washingtoni (Merriam)

1896. *Putorius washingtoni* Merriam, N. Amer. Fauna, 11: 18, June 30, type from Trout Lake, Mt. Adams, Washington.
1936. *Mustela frenata washingtoni*, Hall, Carnegie Inst. Washington Publ. 473:106, November 20.

MARGINAL RECORDS (Hall, 1951e:297).—Washington: Spray Park; *Owyhigh Lakes; Gotchen Creek, 3500 ft.* Oregon: Permilia Lake, Mt. Jefferson. Washington: *type locality; Nisqually entrance.*

Mustela frenata xanthogenys Gray

1843. *Mustela xanthogenys* Gray, Ann. Mag. Nat. Hist., ser. 1, 11:118, type probably from bank of Sacramento River below mouth of Feather River, or possibly from north shore of San Francisco Bay, California.
1936. *Mustela frenata xanthogenys*, Hall, Carnegie Inst. Washington Publ. 473:107, November 20.

MARGINAL RECORDS.—California (Hall, 1951e:319): type locality; 5 mi. S Fair Oaks; Clovis; Milo; *Poplar*; 2 mi. N Tipton; Mendota; Los Baños.

Subgenus **Putorius** Cuvier—Ferrets and Polecats

1817. *Putorius* Cuvier, Le règne animal . . . , 1:147. Type, *Mustela putorius* Linnaeus.
1840. *Foetorius* Keyserling and Blasius, Wirbelthiere Europas, p. 66. Type, *Mustela putorius* Linnaeus.
1877. *Cynomyonax* Coues, Fur-bearing animals, U.S. Geol. Surv. Territories, Miscl. Publ., 8:99. Type, *Putorius nigripes* Audubon and Bachman.

Fur not modified for aquatic life; mastoid processes of skull remarkably angular and projecting.

This subgenus includes the Old World polecats and the ferrets of the Old and New World. The characters of some of the American weasels and some Old World polecats so nearly grade into each other that the subgeneric name *Putorius* could be discarded.

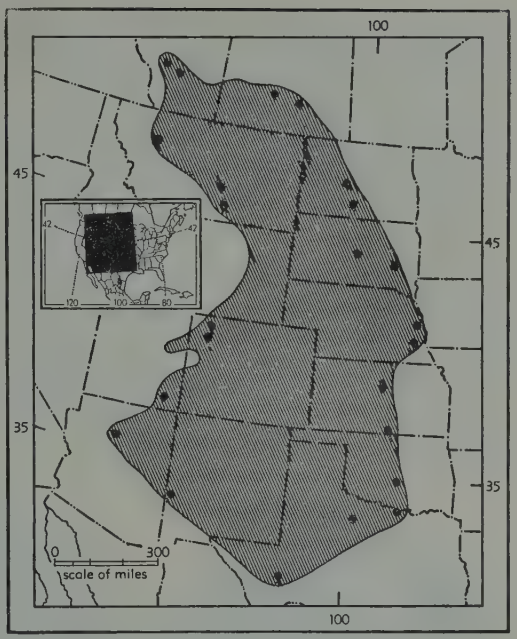
Mustela nigripes (Audubon and Bachman)
Black-footed Ferret

1851. *Putorius nigripes* Audubon and Bachman, The viviparous quadrupeds of North America, 2:297, type from Fort Laramie, Goshen Co., Wyoming.

1912. *Mustela nigripes*, Miller, Bull. U.S. Nat. Mus., 79: 102, December 31.

External measurements of male: 500–533; 114–127; 60–73; ear from notch, 29–31. Basilar length of skull of 2 males from Coolidge, Kansas, 62.2, 66.8; zygomatic breadth, 38.8 and 43.0. Tail vertebrae 17 in number and their combined length 22 to 25 per cent of length of head and body. Females approximately 10 per cent less in linear measurements. Pelage pale yellowish buff becoming nearly white on face, throat, ventral half of body; top of head and middle of back brown; black mask across eyes; feet, legs, and terminal fourth of tail black to blackish brown; remainder of tail whitish or with top side like back. Pelage in winter only slightly paler than in summer.

The geographic range of the black-footed ferret nearly coincides with the range of the prairie dogs (genus *Cynomys*). The ferret may be dependent on the burrows of the prairie dog for shelter and on the occupants of the burrows for food.



Map 466. *Mustela nigripes*.

MARGINAL RECORDS.—Alberta: at or near Calgary (Soper, 1946:137); Blackfoot Reserve near Gleichen (Anderson, 1947:68). Saskatchewan (Soper, 1946:137); 3 mi. W Grayburn; 4 mi. SE Regina. North Dakota (V. Bailey, 1927:172); near Stanton; near Fort Rice. South Dakota: Pierre (122620 NM); Wessington Springs (Cahalane, 1954: 420). Nebraska (Fichter and Jones, 1953:385, 387): Fremont; Lincoln. Kansas (Cockrum, 1952:251): E of Lucas; Kingman. Oklahoma: 1 mi. E Norman (Arvey and Glass, 1950:460). Texas: Gainesville (15018 NM); Seymour (V. Bailey, 1905:197); Fort Stockton (V. Bailey, 1905:198). New Mexico: Center-fire Creek, 10 mi. NE Luna (V. Bailey, 1932:326). Arizona: Red Lake Farming district north of Williams in Coconino County (Young and Halloran, 1952: 251). Utah: 2 mi. S Blanding (Durrant, 1952:422). Colorado: within a mile of Meeker (Warren, 1942:63); 22 mi. N Craig (95093 MVZ). Montana: 10 mi. SE Billings (Crabb and Watson, 1950:99); 5 mi. S Lavina (*ibid.*); Chouteau (234138 BS).

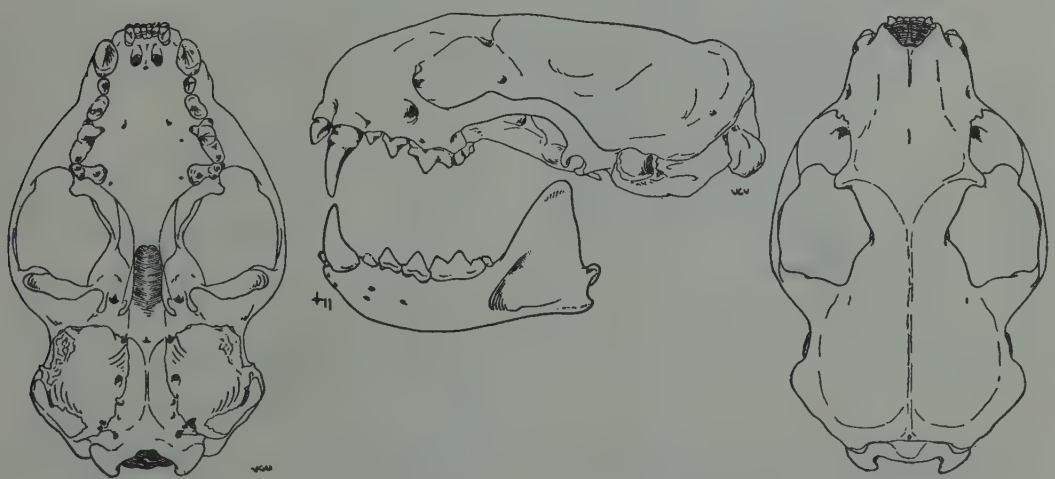


Fig. 490. *Mustela nigripes*, near Coolidge, Hamilton Co., Kansas, No. 11077 K.U., ♂, X 1.

Subgenus **Lutreola** Wagner—Minks

Revised by Hollister, Proc. U.S. Nat. Mus., 44:471–480, April 18, 1913.

1841. *Lutreola* Wagner, *in* Schreber, Die Säugthiere . . . ; Suppl., 2:239. Type, *Mustela lutreola* Linnaeus.
1843. *Vison* Gray, List of the . . . Mammalia in the . . . British Museum, p. 64. Type, *Mustela lutreola* Linnaeus.
1871. *Hydromustela* M. Bogdanov, Ptit i zvepy tschernozemnoi polosy Povolzhia, «Tzudy Obshtsh. est. pri kaz. Univ.» 1, p. 167. Type, *Mustela lutreola* Linnaeus.

Fur modified for aquatic life; m1 with suggestion of metaconid; tympanic bullae less flattened than in most members of the subgenera *Mustela* and *Putorius*. The characters of some members of the subgenus *Mustela* so nearly intergrade with those of the subgenus *Lutreola* that recognition of the latter may serve no useful purpose. The subgenus *Lutreola* includes the minks of Eurasia and North America.

Mustela vison
Mink

External measurements of males: 491–720; 158–194; 57–75. Basilar length of skull, 58–69; zygomatic breadth, 36–47. Tail vertebrae 18–20 in number and averaging 41 to 51 per cent of length of head and body. Females averaging 10 or more per cent smaller than males and half as heavy. Dark brown except for white spots somewhere on underparts (throat, chest or belly) of some individuals; brown most intense near tip of tail and along middle of back.

The mink swims so well that it catches fish under water; it lives along streams, edges of ponds and lakes, and the sea coast; the animal is, however, at home on the land and climbs some but less than the long-tailed weasel. The mink eats mice, rats, rabbits, frogs, fish, turtle eggs, birds, and other animals. Dens often are in abandoned burrows of the muskrat. One litter per year of 4 to 10 young are born after a gestation period of 39 to 76 days.

Mustela vison aestuarina Grinnell

1916. *Mustela vison aestuarina* Grinnell, Proc. Biol. Soc. Washington, 29:213, September 22, type from Grizzly Island, Solano Co., California.

MARGINAL RECORDS (Grinnell, *et al.*, 1937:241, unless otherwise noted).—California: Jackson Lake; Eagle Lake. Nevada (Hall, 1946:194, unless otherwise noted): 7 mi. S Reno; Wadsworth; 1 mi. NNW Fallon, 4000 ft. (35124 KU); Walker River, 14 mi. N Yerington; E. Fork Carson River, 5 mi. SE Minden. California: Fish Springs; Summit Lake, 12 mi. NW Lemoore; Firebaugh; type locality; Carlotta.

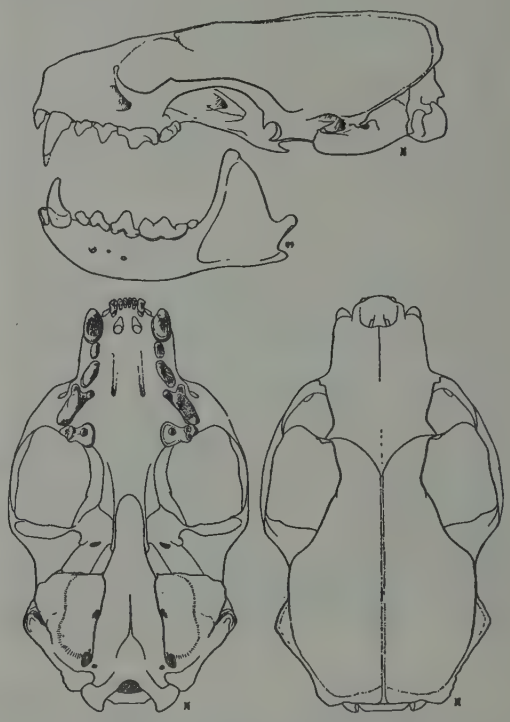


Fig. 491. *Mustela vison energumenos*, Goose Creek, 5000 ft., Elko Co., Nevada, No. 74391 M.V.Z., ♂, X 1.

Mustela vison energumenos (Bangs)

1896. *Putorius vison energumenos* Bangs, Proc. Boston Soc. Nat. Hist., 27:5, March, type from Sumas, British Columbia.
1912. *Mustela vison energumenos*, Miller, Bull. U.S. Nat. Mus., 79:101, December 31.

MARGINAL RECORDS.—Mackenzie (Preble, 1908: 230): Fort Norman; Fort Simpson. Alberta (Preble, 1908: 229–230): Athabaska River near Boiler Rapids; Moose Creek; Whitemud Creek. Montana: Glacier National Park (V. Bailey, 1918:86). Wyoming: Yellowstone National Park (V. Bailey, 1927:339); Wind River, 6 mi. W, 2 mi. N Burris, 6450 ft. (32342 KU); Woods (Hollister, 1913:479). Colorado (Cary, 1911:183–184): Loveland; Colorado Springs; La Veta. New Mexico: vicinity of Cimarron (Hill, 1942:78); Pecos River Mts. (V. Bailey, 1932:324); Liberty (V. Bailey, 1932:325). Utah: La Sal National Forest (Durrant, 1952:421). Colorado (Cary, 1911:183): Rangely;

Green River near Ladore. Utah (Durrant, 1952:421): Sheep Creek; below Murdock Power Plant, Provo River; Mt. Timpanogos; small cave, S slope, mouth Emigration Canyon, 4800 ft.; Logan River. Idaho: Snake River, 3 mi. SE Acequia (Davis, 1939:138). Nevada (Hall, 1946:195): Goose Creek, 5000 ft., 100 yds. W Utah boundary; Deeth; Ruby Lake. California: Sisson, Cold Creek (Merriam, 1899:105), thence west to Pacific Coast at approximately the boundary between California and Oregon and up the coast to Alaska: Wrangell (Swarth, 1924:374); lower

Map 467. *Mustela vison* and *Mustela macrodon*.

Guide to kinds
1. *M. v. aestuarina*
2. *M. v. energumenos*
3. *M. v. evagor*
4. *M. v. evergladensis*
5. *M. v. ingens*
6. *M. v. lacustris*
7. *M. v. letifera*
8. *M. v. lowii*
9. *M. v. lutensis*
10. *M. v. melampeplus*
11. *M. v. mink*
12. *M. v. nesolestes*
13. *M. v. vison*
14. *M. v. vulgivaga*
15. *M. macrodon*

Taku River (*ibid.*). British Columbia: Atlin (Rand, 1945b: 28). Yukon: Champagne, N side Dezadeash River (Baker, 1951:115; S. Fork Macmillan River, mile 49 (Rand, 1945a:31).

Mustela vison evagor Hall

1932. *Mustela vison evagor* Hall, Univ. California Publ. Zool., 38:418, November 8, type from Little Qualicum River [8 to 9 mi. W Parkaville], Vancouver Island, British Columbia. Confined to Vancouver Island, so far as known, except as artificially introduced elsewhere.

Mustela vison evergladensis Hamilton

1948. *Mustela vison evergladensis* Hamilton, Proc. Biol. Soc. Washington, 61:139, September 3, type from Tamiami Trail (U.S. Route 94), 5 mi. SE Royal Palm Hammock, Collier Co., Florida.

MARGINAL RECORDS.—Florida: type locality; *extreme south of Florida* (Allen and Neill, 1952:113).

Mustela vison ingens (Osgood)

1900. *Lutreola vison ingens* Osgood, N. Amer. Fauna, 19: 42, October 6, type from Fort Yukon, Alaska.
1912. *Mustela vison ingens*, Miller, Bull. U.S. Nat. Mus., 79:101, December 31.

MARGINAL RECORDS.—Mackenzie: Mackenzie Delta (Porsild, 1945:11); east to Anderson River (Anderson, 1947:67); Fort Good Hope (*ibid.*); Ogilvie Mts. (Rand, 1945b:28). Alaska: near Fairbanks (Dice, 1921:22); Wonder Lake, Mt. McKinley Dist. (Dixon, 1938:150); Andraefski (Hollister, 1913:479); Imuruk Lake (Quay, 1951:91); Chandler Lake (Rausch, 1950:465).

Mustela vison lacustris (Preble)

1902. *Lutreola vison lacustris* Preble, N. Amer. Fauna, 22: 66, October 31, type from Echimamish River (near Painted Stone portage), Manitoba.
1912. *Mustela vison lacustris*, Miller, Bull. U.S. Nat. Mus., 79:101, December 31.

MARGINAL RECORDS.—Mackenzie: Great Bear Lake (Anderson, 1937:106). Manitoba: up Churchill River (Preble, 1902:66). Ontario: Lake Nipigon (Dymond, 1928:241). Minnesota: Isabella River (Surber, 1932:50); Thief Lake Refuge (Swanson, 1945:66). North Dakota (Soper, 1946:137): Pembina River; Turtle Mtn.; Souris River. Alberta: Lodge and North Fork creeks (*ibid.*); Wood Buffalo Park (Anderson, 1947:67). Mackenzie: Great Slave Lake (*ibid.*).

Mustela vison letifera Hollister

1913. *Mustela vison letifera* Hollister, Proc. U.S. Nat. Mus., 44:475, April 18, type from Elk River, Sherburne Co., Minnesota.

MARGINAL RECORDS.—North Dakota (V. Bailey, 1927:173–174): Lake Irwin; Drayton. Minnesota: Clearwater County (Swanson, 1945:66). Michigan: Big Huron River (Harris, 1928:18). Wisconsin: Apostle Islands (Jackson, 1920:62). Indiana: northwestern corner of Indiana (Hollister, 1913:475). Illinois: Urbana (Necker and Hatfield, 1941:47). Iowa: Leon (Scott, 1937:60). Kansas: Linn County (Cockrum, 1952:246). Oklahoma (Blair, 1939:105): Stillwater Creek near Stillwater; 2 mi. S Norman. Kansas: Logan County (Cockrum, 1952:246). Colorado: 3 mi. N Pawnee Butte (2512 KU). North Dakota: Goodall (V. Bailey, 1927:174).

Mustela vison lowii Anderson

1945. *Mustela vison lowii* Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, for 1944, p. 57, November 2, type from Mistassini Post, Mistassini Lake, Mistassini District, Quebec.

MARGINAL RECORDS.—Quebec (Anderson, 1947:68): Chimo; type locality; Lake Waswanipi.

Mustela vison lutensis (Bangs)

1898. *Putorius* (*Lutreola*) *lutensis* Bangs, Proc. Boston Soc. Nat. Hist., 28:229, March, salt marsh off Matanzas Inlet, St. Johns Co., Florida.
1913. *Mustela vison lutensis*, Hollister, Proc. U.S. Nat. Mus., 44:474, April 18.

MARGINAL RECORDS.—South Carolina: Mount Pleasant (Hollister, 1913:479), down coast to Florida: Miami City (H. H. Bailey, 1930:unpaged), thence westerly to Gulf Coast and up coast to Cedar Keys (Sherman, 1937: 111).

Mustela vison melampeplus (Elliot)

1903. *Putorius vison melampeplus* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3:170, May 2, type from Kenai Peninsula, Alaska.
1912. *Mustela vison melampeplus*, Miller, Bull. U.S. Nat. Mus., 79:102, December 31.

MARGINAL RECORDS.—Alaska: Chulitna River (Osgood, 1904:45); Disc Island, Prince William Sound (Swarth, 1911:139); *Cold Bay* (Osgood, 1904:46); Nushagak River (Osgood, 1904:45); Kakhtul River (*ibid.*).

Mustela vison mink Peale and Palisot de Beauvois

1796. *Mustela mink* Peale and Palisot de Beauvois, A scientific and descriptive catalogue of Peale's museum, Philadelphia, p. 39. Type locality, Maryland.
1914. *Mustela vison mink*, Hollister, Proc. Biol. Soc. Washington, 27:215, October 31.
1825. *Mustela lutreocephala* Harlan, Fauna Americana, p. 63. Type locality, Maryland.
1858. *M[ustela]. rufa* Hamilton-Smith, The naturalist's library (edit. Jardine), 15:189. Type locality, New York.

MARGINAL RECORDS.—Maine: Flatt Island (G. M. Allen, 1904:25), thence down coast to South Carolina and on southward inland to Georgia: Hull's Branch, about 2 mi. above Camp Pinckney, Florida (Harper, 1927:306). Alabama: Bayou Labatre (A. H. Howell, 1921:37). Arkansas: near Augusta (Dellinger and Black, 1940:188); around Huntsville (Black, 1936:31); Alix (*ibid.*). Texas (V. Bailey, 1905:196, unless otherwise noted): Texarkana; Rockland; lower Guadalupe River; Mason; Wanderers Creek, 4 mi. SW

Chillicothe (Taylor, 1944:411). Oklahoma (Blair, 1939: 104): Pittsburgh County; Mohawk Park. Iowa: Iowa City (Scott, 1937:60). Illinois: near Ashmore (22019 KU). Indiana: South Bend (Ingles, 1933:6). New York (Miller, 1899:351): Erie County; Peterboro. West Virginia: Peters Creek (Kellogg, 1937:453). Kentucky: Rowan County (Walter and Sollberger, 1939:79). Virginia: Nelson County (Handley and Patton, 1947:133). New York: North Chatham (Schoonmaker, 1929:150). Massachusetts: Hampshire County (Crane, 1931:268).

Mustela vison nesolestes (Heller)

1909. *Lutreola vison nesolestes* Heller, Univ. California Publ. Zool., 5:259, February 18, type from Windfall Harbor, Admiralty Island, Alaska.
1912. *Mustela vison nesolestes*, Miller, Bull. U. S. Nat. Mus., 79:102, December 31.

MARGINAL RECORDS.—Alaska (Heller, 1909:261, unless otherwise noted).—Type locality; Kupreanof Island; Cleveland Peninsula; Revillagigido Island; Prince of Wales Island; Egg Harbor, Coronation Island (Swarth, 1911: 139); Sitka (Hollister, 1913:479).

Mustela vison vison Schreber

1777. *Mustela vison* Schreber, Die Säugthiere . . . , pl. 127b. Type locality, eastern Canada (= Quebec).
1854. *Putorius nigrescens* Audubon and Bachman, The viviparous quadrupeds of North America, 3:104. Name applied to animals from mountains of Pennsylvania, northern New York, Vermont, and Canada.
1858. *Mustela wiringus* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):177, July 14 (in synonymy).
1911. *Lutreola vison borealis* Brass, Aus dem Reiche der Pelze, p. 504, April. Type locality, northeastern North America.

MARGINAL RECORDS.—Labrador: Hamilton River (Bangs, 1898:504); Black Bay (Bangs, 1899:17). Quebec: Prince Edward Island (Anderson, 1945:58). Nova Scotia: Digby (Bangs, 1896:3). Maine: 6 mi. inland, Westbrook (Norton, 1930:27). Vermont: Rutland (F. L. Osgood, 1938:437). New York: Catskill Mts. (Anderson, 1947:67). West Virginia: White Sulphur Springs (Elliot, 1907:447). Tennessee (Kellogg, 1939:262): Roan Mtn.; Greenbrier. Kentucky: near Lynch (Barbour, 1951:104). West Virginia: Shavers River (Kellogg, 1937:453). Pennsylvania: near Lopez (Green, 1930:13). New York: Saranac Lake (Coues, 1877:169). Ontario: vicinity of Long Point (Snyder, 1928:9); London (Saunders, 1932:284); Mace, Lake Abitibi (Snyder, 1928:9).

Mustela vison vulgivaga (Bangs)

1895. *Putorius* (*Lutreola*) *vulgivagus* Bangs, Proc. Boston Soc. Nat. Hist., 26:539, July 31, type from Burbridge, Plaquemines Parish, Louisiana.
1912. *Mustela vison vulgivaga*, Miller, Bull. U.S. Nat. Mus., 79:102, December 31.

MARGINAL RECORDS.—Arkansas: Boone County (Hall, 1936:115). Louisiana: type locality; Iowa (Hollister, 1913: 479).

Mustela macrodon (Prentiss)
Sea Mink

1903. *Lutreola macrodon* Prentiss, Proc. U.S. Nat. Mus., 26: 887, July 6, type from shellheaps at Brookline, Hancock Co., Maine.
1912. *Mustela macrodon*, Miller, Bull. U.S. Nat. Mus., 79: 101, December 31.
1911. *Lutreola vison antiquus* Loomis, Amer. Jour. Sci., 31:228, March, type from Flagg Island, Casco Bay, Maine.

Differs from *M. vison* in larger size; for example, in males, the length of the upper molar-premolar tooth-row measures 21 (in holotype) instead of less than 20 mm. Known from skeletal remains only; according to Hardy (Forest and Stream, 61:125, August 15, 1903) the animal became extinct about the year 1860.

MARGINAL RECORDS.—New Brunswick: Campobello Island (Manville, 1942:394). Maine: Great Diamond Island, Casco Bay (Norton, 1930:27).

Genus Eira Hamilton-Smith—Tayra

Reviewed (under the name *Tayra*) by Krumbiegel, Zool. Anzeiger, 139:81–96, August 15, 1942.

1842. *Eira* Hamilton-Smith, The naturalist's library (edit. Jardine), 35 (Mammalia, vol. 13, introduction):201, December. Type, *Eira barbara* [= *Mustela barbara* Linnaeus].
1816. *Tayra* Oken, Lehrbuch der Naturgeschichte, pt. 3 (Zool.), sect. 2, p. 1001. Type, *Mustela barbara* Linnaeus. Oken's names are not available (see Hershkovitz, Jour. Mamm., 30:295, August 17, 1949).
1839. *Eiraria* Lund, Ann. Sci. Nat., Paris, ser. 2, 11:232, April. Included species, *Mustela vittata* Linnaeus and *Mustela barbara* Linnaeus.
1843. *Galera* Gray, List . . . Mammalia in the . . . British Museum, pp. xx, 67. Type, *Mustela barbara* Linnaeus. Not *Galera* Browne, 1789 (see J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:377, October 11, 1902, and 24:586–589, September 11, 1908; and Hershkovitz, Jour. Mamm., 30:295, August 17, 1949).

Up to one and one-tenth meters long; body long, slender; tail long; neck long; head broad; legs short. Head and neck gray or brown; body black or dark brown; yellow or white spot on chest. Teeth sectorial, deuterocone of upper carnassial anterior in position and narrow-necked, occupying less than half inner surface of tooth; upper molar wider than long; in m1, talonid semi-basined. Carpal pads fused, long and wide, and in contact with plantar pad; bursa of ear shallow and remote from posterior edge; subcaudal pouch shallow; baculum unbranched apically. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{1}{2}$.

Eira barbara
Tayra

External measurements of some Central American specimens: (♂) 1075–1125, 425–455; (♀) 999–1095, 390–440. Condylobasal length, (♂) 101–120.5; (♀) 98–108.5; zygomatic breadth, (♂) 66.5–80.5; (♀) 60–68; length of maxillary tooth-row, (♂) 33–35; (♀) 33.9–38.7.

The tayra tends to be diurnal, inhabits tropical forests, and climbs, runs, and swims well. Tayras often are found in pairs or family-groups, and feed on many species of small mammals and birds, as well as on fruit. Little is known of the breeding habits of the tayra; the number of young is believed to be 3 or 4.

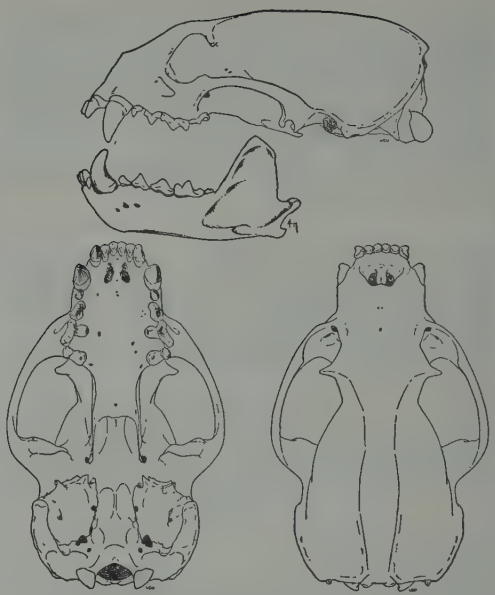


Fig. 492. *Eira barbara senex*, 38 km. SE Jesús Carranza, 500 ft., Veracruz, No. 24545 K.U., ♀, X ½.

Eira barbara biologiae (Thomas)

1900. *Galictis barbara biologiae* Thomas, Ann. Mag. Nat. Hist., ser. 7, 5:146, January, type from Calovévora [= Calovébora], Veraguas, Panamá.

Map 468. *Eira barbara.*

1. *E. b. biologiae* 2. *E. b. inserta* 3. *E. b. senex*

1908. *T[ayra]. barbara biologiae*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:662, October 13.

MARGINAL RECORDS.—Costa Rica: Cuabre (Goodwin, 1946:434), thence eastward into South America.

Eira barbara inserta (J. A. Allen)

1908. *Tayra barbara inserta* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:662, October 13, type from Uluse, Matagalpa, Nicaragua.

MARGINAL RECORDS.—Honduras (Goodwin, 1942: 179): Cantoral; Catecamas. Nicaragua: Peña Blanca (J. A. Allen, 1910:105). Costa Rica: Zacéro (Goodwin, 1946: 434). Nicaragua: type locality.

Eira barbara senex (Thomas)

1900. *Galictis barbara senex* Thomas, Ann. Mag. Nat. Hist., ser. 7, 5:146, January, type from Hacienda Tortugas, approximately 600 ft., Jalapa, Veracruz.
1951. *Eira barbara senex*, Hershkovitz, Fieldiana-Zool., 31: 561, July 10.

MARGINAL RECORDS.—Tamaulipas: Pano Ayuctle (Hooper, 1953:4). Veracruz: type locality, thence southward along coast to Guatemala (Goodwin, 1934:21): Finca Concepción; Finca El Espino, thence northward along coast to Sinaloa: Escuinapa (J. A. Allen, 1906:235). San Luis Potosí: 8 mi. E Santa Barbarita (Dalquest, 1953b:189).

Genus **Galictis** Bell—Grisons

Revised (under the name *Grison*) by Krumbiegel, Zool. Anzeiger, 139:97–108, August 15, 1942.

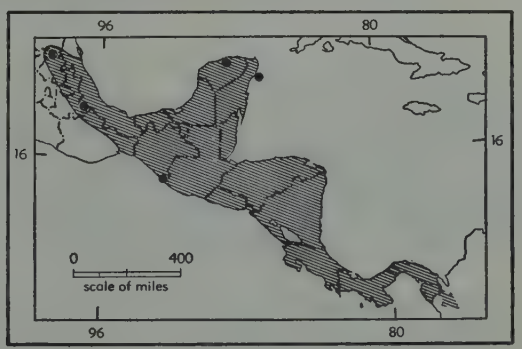
1826. *Galictis* Bell, Zool. Jour., 2:552, April. Type, *Viverra vittata* Schreber.
1816. *Grison* Oken, Lehrbuch der Naturgeschichte, pt. 3 (Zool.), sect. 2, p. 1000. Type, *Viverra vittata* Schreber. Oken's names regarded as unavailable by Hershkovitz, Jour. Mamm., 30:289–301, August 17, 1949.
1825. *Grisonia* Gray, Ann. Philos., 26:339, a *nomen nudum*.
1829. *Grisonia* Fischer, Synopsis mammalium, p. 154, a *nomen nudum*.
1843. *Grisonia* Gray, List of the . . . Mammalia in the . . . British Museum, p. 68. Based on *Viverra vittata* of Schreber.
1912. *Grisonella* Thomas, Ann. Mag. Nat. Hist., ser. 8, 10: 46. Type, *Mustela cuja* Molina.

Up to 96 cm. long; tail short; body slightly flattened dorsoventrally. Upper parts black or brown, grizzled with white- or yellow-tipped hairs; underparts black or brown, with few white- or yellow-tipped hairs. Teeth sectorial, deuterocone of upper carnassial occupying nearly half of inner surface of tooth; upper molar wider than long; in m1, talonid trenchant. Carpal pads fused, as long and wide as plantar pad, but separated from it. Pinna of ear well developed with small bursa in front of posterior margin. Subcaudal pouch absent. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{1}{2}$

Galictis allamandi
Grisón

Characters essentially as for the genus. *G. allamandi* differs from *G. vittata*, the only other species, in being larger (length of head and body to 800 mm., basal length to 90 (♂), 85 (♀)), with shorter tail (up to 20 per cent of length of head and body), having fewer (17–18) tail vertebrae, having a metaconid on m1 and a stronger cingulum on the inner side of P3, and having the underparts extensively flecked with white.

Grisóns are good swimmers, climbers, and burrowers. In captivity they prefer warm-blooded animals to all other foods, but accept some fruits, invertebrates, and cold-blooded vertebrates. Grisóns occur southward throughout much of South America. They are said to have 2 to 4 young in a litter.



Map 469. *Galictis allamandi canaster.*

Galictis allamandi canaster Nelson

1901. *Galictis canaster* Nelson, Proc. Biol. Soc. Washington, 14:129, August 9, type from near Tunkás, Yucatán.

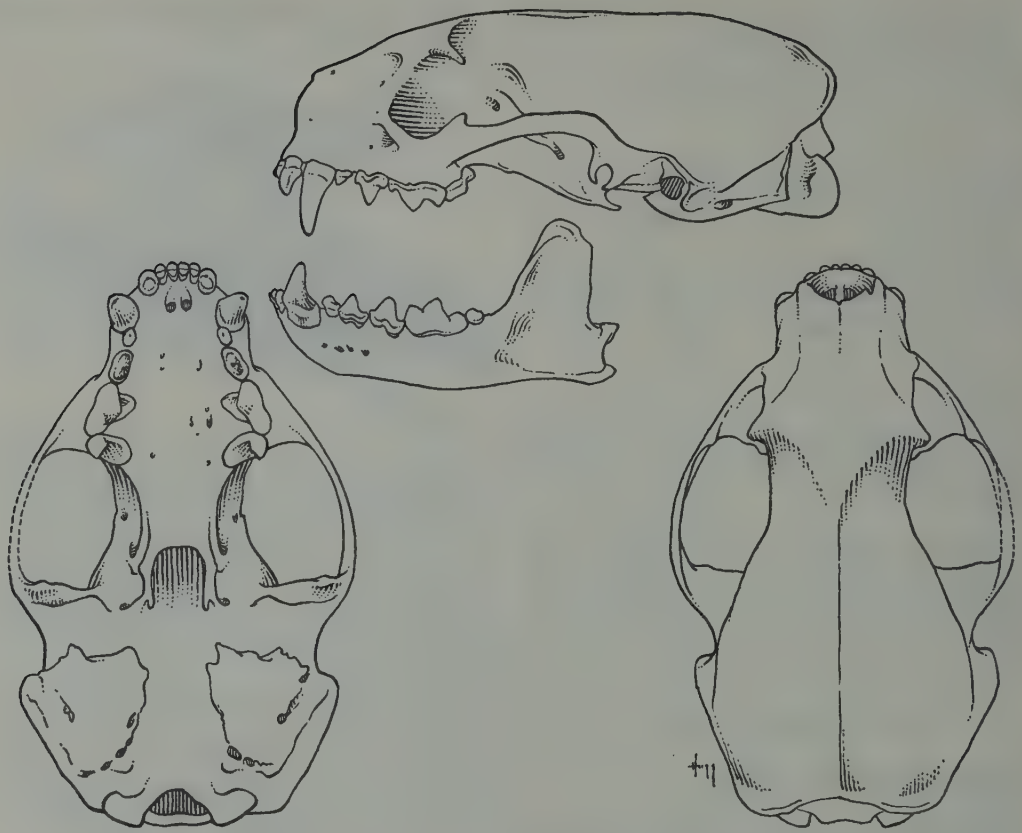


Fig. 493. *Galictis allamandi canaster*, 20 km. ENE Jesús Carranza, 200 ft., Veracruz, No. 32222 K.U., sex ?, X 1.

1942. [*Grison allamandi*] *canaster*, Krumbiegel, Zool. Anzeiger, 139:105, August 15.

MARGINAL RECORDS.—San Luis Potosí: Xilitla (Dalquest, 1953b:191), thence eastward to Gulf Coast and along coast to Yucatán: Buctzatz (Gaumer, 1917:235, as *G. vittata*). Quintana Roo: Cozumel Island (873 KU), thence along Caribbean Coast into South America; northward along Pacific Coast to Chiapas: Río Coatán (Gaumer, 1917:235, as *G. vittata*). Veracruz: Orizaba (Goodwin, 1946:435).

Genus Gulo Pallas—Wolverines

1780. *Gulo* Pallas, Spicilegia zoologica . . . , fasc. 14, p. 25. Type, *Gulo sibiricus* Pallas [= *Mustela gulo* Linnaeus].

External measurements of male: 900–1125; 190–260; 180–192. Basal length of skull, 127–140. Weight, 24–40 lbs. Females average 10 per cent less in linear measurements and 30 per cent less in weight. General color, blackish brown; paler and grayer on crown and cheeks; broad light brown stripe begins on each side of neck and extends back along side of body to join its opposite over and across base of tail; throat and chest more or less spotted with yellowish white; whitish on middle of abdomen over area of dermal gland there. Facial angle of skull steep; tympanic bullae moderately inflated and separate from paroccipital processes; palate behind upper molars; inner moiety of M1 larger than outer; P4 with simple deuterocone; in m1, talonid longer than trigonid, metaconid absent, talonid barely semitrenchant and with single, median longitudinal ridge. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{1}{2}$. Foot-soles naked in summer and densely haired in winter; largest living North American member of its family.

Gulo luscus
Wolverine

Characters as given for the genus. The wolverine seems to be unexcelled in strength among mammals of its size and feeds on a variety of animals. Its exceptionally strong jaws and robust teeth permit it to crush large bones with ease. The nursing young are paler than adults, and nearly white. The common numbers in litters are 2 and 3, but up to 5 have been reported. As in many other mustelids there seems to be a long period between fertilization of the ovum and its implantation; length of the gestation period is not known. Wolverine fur sheds rime (frozen moisture from a person's breath) better than most other fur and is used for the facial ruff on parka hoods in the far north.

Gulo luscus katschemakensis Matschie

1918. *Gulo katschemakensis* Matschie, Sitzungsber. Gesell. naturforsch. Freunde, Berlin, p. 151, July 30, type from Katschemak Bay, Kenai Peninsula, Alaska. Known only from the Kenai Peninsula. Examination of the holotype by one of us (Hall, in 1937) and examination of another individual from the Kenai Peninsula (Tustumena Lake, 2977 KU) indicates that *G. katschemakensis* is at most subspecifically different from *Gulo luscus*.

Gulo luscus luscus (Linnaeus)

1758. [*Ursus*] *luscus* Linnaeus, Syst. nat., ed. 10, 1:47. Type locality, Hudson Bay.

1823. *Gulo luscus*, Sabine, *in* Franklin, Narrative of a journey to the shores of the Polar Sea in . . . 1819–22, p. 650. (Regarded as a subspecies of *Gulo gulo* by Degerbøl, Rept. 5th Thule Exped., 2(No. 4):35, 1935, and by some later writers.)

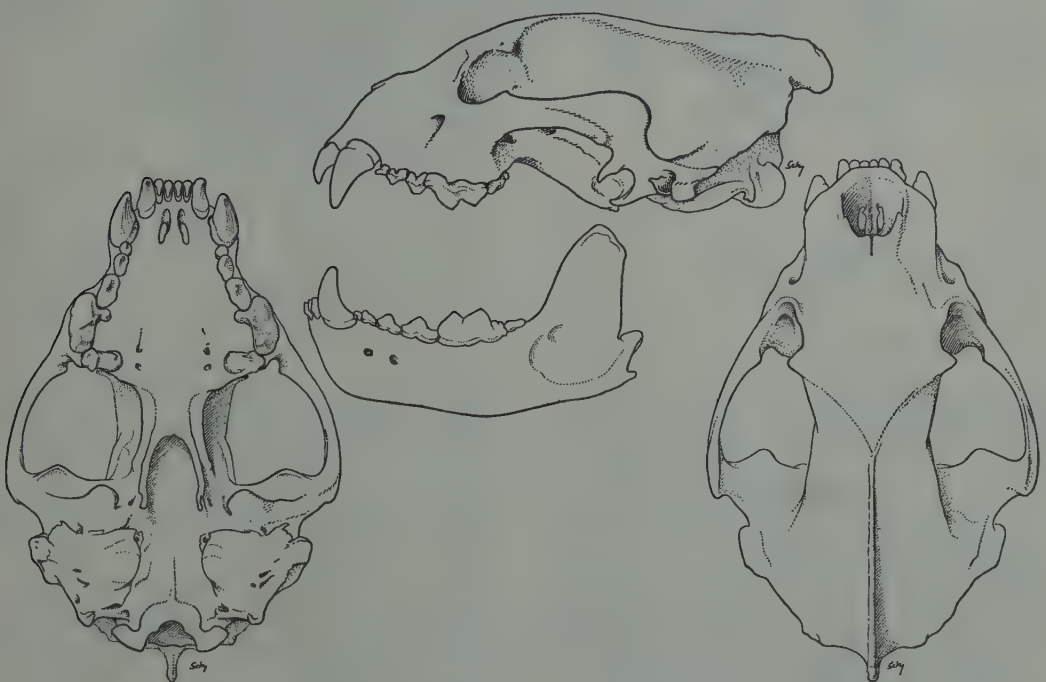


Fig. 494. *Gulo luscus luteus*, head Lyell Canyon, Tuolumne Co., California, No. 22121 M.V.Z., ♂, X ½.

Map 470. *Gulo luscus.*

1. *G. l. katschemakensis* 2. *G. l. luscus* 3. *G. l. luteus* 4. *G. l. vancouverensis*

1905. *Gulo hylaeus* Elliot, Proc. Biol. Soc. Washington, 18:81, February 21, type from Susitna River, in the region of Mt. McKinley, Alaska. (Regarded as inseparable from the subspecies *luscus* by Rausch, Arctic, 6:114, 1953.)

1918. *Gulo niediecki* Matschie, Sitzungsber. Gesell. naturforsch. Freunde, Berlin, p. 148, July 30, type from Dease Lake, British Columbia. (Regarded by Anderson, Bull. Nat. Mus. Canada, 102:69, January 24, 1947, as indistinguishable from subspecies *luscus.*)

1918. *Gulo audubonl* Matschie, Sitzungsber. Gesell. naturforsch. Freunde, Berlin, p. 153, July 30. Based on specimens from Newfoundland and New York. (Regarded by Anderson, Bull. Nat. Mus. Canada, 102:68, January 24, 1947, as indistinguishable from subspecies *luscus.*)

1918. *Gulo bairdi* Matschie, Sitzungsber. Gesell. naturforsch. Freunde, Berlin, p. 153, July 30, type from northwest of Fort Union, situated near present town of Buford, Williams Co., North Dakota. (Regarded by Anderson, Bull. Nat. Mus. Canada, 102:69, January 24, 1947, as indistinguishable from subspecies *luscus.*)

MARGINAL RECORDS.—Franklin: Ellesmere Island (Anderson, 1947:69); Baffin Land: Pond Inlet (Anderson, 1937:106); Cumberland Sound on SE coast (Seton, 1929: 410–411). Labrador: Okak (Bangs, 1898:501). Newfoundland (Anderson, 1947:68, record questioned). New Brunswick: Canterbury Station (Elliot, 1907:442). New Hampshire: Diamond region E of Connecticut Lakes (Jackson, 1922:13). New York: Rensselaer County (Merriam, 1882: 48). Pennsylvania: near Great Salt Lick in Portage Township (G. M. Allen, 1942a:187). Indiana (Lyon, 1936: 113): Washington Township in Noble Co.; near Edwardsport in Knox Co. Wisconsin: 2½ mi. W Gotham (Jackson,

1954:254); La Crosse County (G. M. Allen, 1942a:189). Minnesota: about 12 mi. N Bemidji (Swanson, 1945:67). North Dakota: mouth Cherry Creek near Killdeer Mts. (V. Bailey, 1927:179). Nebraska: Chimney Rock (Beidleman, 1956:446). Wyoming: Yellowstone National Park (V. Bailey, 1927:340). Utah: Red Canyon country of Green River (R. D. Svihla, 1931:259). Colorado (Warren, 1942:67–70, unless otherwise noted): Elk River between mouth of Mad Creek and Big Creek; Moraine S of Moraine Park; *near Boulder*; mountains of Clear Creek County; head of Huerfano River (Cary, 1911:192). *New Mexico: northern New Mexico* (V. Bailey, 1932:322). Colorado: La Plata Mts. (Cary, 1911:192); Alexander Mesa, Grand Mesa (Warren, 1942:69); 6 mi. E Meeker (*ibid.*). Utah (Durrant, 1952: 426): Boulder Mts.; Mt. Baldy; Fillmore; near Brighton; Bear River. Idaho (Davis, 1939:139): Wolverine Creek; Sawtooth Mts. British Columbia (Cowan and Guiguet, 1956:327): Nelson; Horsefly River; Bella Coola, to Pacific Coast and along coast to Alaska: Polk Point on Wrangell Island (Webster, 1949:81); Yakutat (Elliot, 1907:442, as *G. luteus*); thence northwest excluding Kenai Peninsula, to Stepovak Bay (Grinnell, *et al.*, 1937:254); Imuruk Lake (Quay, 1951:91); 2 mi. up Avalik River (Bee and Hall, 1956:215). Mackenzie: Mackenzie Delta (Porsild, 1945: 11). Franklin: *Victoria Island* (G. M. Allen, 1942a:188); *Melville Island* (Preble, 1908:240) northeasterly on mainland, and possibly on other Arctic islands to point of beginning. Not found: Near Montgomery in Colorado (Cary, 1911:192); Oizenoy Bay on Alaska Peninsula (J. A. Allen, 1903:564); Felix Harbor (Preble, 1908:240).

Gulo luscus luteus Elliot

1904. *Gulo luteus* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3:260, January 7, type from Crater Meadows [= Groundhog Meadows], Whitney Creek [= Golden Trout Creek], 27 mi. S Mt. Whitney, 8700 ft., Tulare Co., California.

1913. *Gulo luscus luteus*, Grinnell, Proc. California Acad. Sci., ser. 4, 3:291, August 28.

MARGINAL RECORDS.—British Columbia: *western British Columbia* (Anderson, 1947:69). Washington: 3 mi. S Riverside (Dalquest, 1948:202); *White River just outside* [*Park*] (Taylor and Shaw, 1927:49); near Muddy Fork of Cowlitz River (*ibid.*). Oregon: Mt. Hood section (V. Bailey, 1936:300); upper Mackenzie Valley west of Three Sisters Peak (G. M. Allen, 1942a:193). California (Grinnell, *et al.*, 1937:255–256, unless otherwise noted): near Carberry Ranch; Virginia Lakes at 10,000 ft.; 8700 ft. at Pine City near Mammoth Pass; 8000 ft. in Monache Meadows; Piute Mts.; near Camp Nelson; 8000 ft. at Chiquito Lake; Mt. Linn (G. M. Allen, 1942a:193); Mt. Sanhedrin (*ibid.*); Mill Creek near Healdsburg; near San Rafael; thence up coast to area of beginning. (For California, Jones, 1955:569, cites and records 26 occurrences, some of which provide marginal records for the Sierra Nevada, but these are not shown on our small-scale map.)

Gulo luscus vancouverensis Goldman

1935. *Gulo luscus vancouverensis* Goldman, Proc. Biol. Soc. Washington, 48:177, November 15, type from Great Central Lake, Vancouver Island, British Columbia. See Cowan (Canadian Field-Nat., 50:145, December 3, 1936) for diagnostic characters additional to those pointed out in the original description.

MARGINAL RECORDS.—British Columbia (Vancouver Island): *Fanny Bay on E side of Island* (Anderson, 1947: 69); *Cowichan Lake* (Cowan, 1937:146); type locality.

Genus **Taxidea** Waterhouse—Badger

1839. *Taxidea* Waterhouse, Proc. Zool. Soc. London, p. 153, for 1838, May. Type, *Meles labradorius* Gmelin [= *Ursus taxus* Schreber].

Skull large, rugose; occiput depressed, facial angle steep; tympanic bullae highly inflated, not in contact with paroccipital processes; palate extending posteriorly beyond plane of upper molars; M1 triangular, often with cusps arranged in rows that are transverse to long axis of skull; P4 with accessory cusp behind deuterocone; trigonid of m1 longer than talonid; metaconid, hypoconid, and entoconid large; talonid often with 1 to 3 additional cusps.

The genus *Taxidea* has but one Recent species.

Taxidea taxus
Badger

External measurements: (♂) 629–870; 108–155; 89–125; (♀) 521–790; 98–155; 89–125. Weight, 3.6–10 kg. Greatest length of skull, (♂) 109.1–138.2; (♀) 108.5–130.5; zygomatic breadth, (♂) 68.9–92; (♀) 64.6–82.2; alveolar length of maxillary tooth-row, (♂) 36.7–44.7; (♀) 35.8–41.8. Upper parts grayish to reddish, guard hairs long, white-tipped with subterminal black band, longest on sides; white stripe extending from nose at least to shoulders; nose, top of head, preauricular and postauricular spots brownish to black; chin, throat and midventral region whitish; underparts buffy; feet dark brown to black.

Badgers are rapid, powerful diggers. They feed largely on burrowing mammals, but carrion, lizards, snakes, and birds are eaten when available. Badgers breed in August and September, but implantation does not occur until mid-February. Usually 2 (1–5) young are born after a gestation period of about 6 weeks.

At present (1956) the genus *Taxidea* is being revised by V. S. Schantz. Until the completed revision is available and the ranges of the 10 sub-

species described by Schantz are delimited clearly, it is impossible to allocate previously recorded specimens to subspecies. Pending the completion of this revision, we have employed subspecies recognized by Hall (Carnegie Inst. Washington Publ., 473:41–119, November 20, 1936) with the addition of *T. t. sonoriensis* Goldman, 1939, and we have arbitrarily allocated Schantz' records to these subspecies wherever necessary.

The subspecies described by Schantz are:

TAXIDEA TAXUS JACKSONI Schantz

1946. *Taxidea taxus jacksoni* Schantz, Jour. Mamm., 26:431, February 12, type from 4 mi. E Milton, Rock Co., Wisconsin. For additional records of occurrence see Schantz, Jour. Mamm., 34:388–389, August 14, 1953.

TAXIDEA TAXUS DACOTENSIS Schantz

1946. *Taxidea taxus dacotensis* Schantz, Proc. Biol. Soc. Washington, 59:81, June 19, type from Folsom, Custer Co., South Dakota.

TAXIDEA TAXUS IOWAE Schantz

1947. *Taxidea taxus iowae* Schantz, Jour. Mamm., 28: 287, September 3, type from near Clarion, Wright Co., Iowa.

TAXIDEA TAXUS APACHE Schantz

1948. *Taxidea taxus apache* Schantz, Proc. Biol. Soc. Washington, 61:175, November 12, type from San Pedro River, Arizona and Sonora, Mexico–United States boundary. Regarded by Hoffmeister and Goodpaster, Illinois Biol. Monogr., 24(1):79, December 31, 1954, as a synonym of *T. t. sonoriensis*.

TAXIDEA TAXUS LITTORALIS Schantz

1949. *Taxidea taxus littoralis* Schantz, Jour. Mamm., 30:301, August 17, type from Corpus Christi, Nueces Co., Texas.

TAXIDEA TAXUS HALLORANI Schantz

1949. *Taxidea taxus hallorani* Schantz, Jour. Mamm., 30:302, August 17, type from Castle Dome Mts., Kofa Game Refuge, Yuma Co., Arizona.

TAXIDEA TAXUS HALLI Schantz

1949. *Taxidea taxus nevadensis* Schantz, Jour. Mamm., 30:304, August 17, type from White Sage Flat, between Desert Range and Sheep Range, Desert Game Range, Clark Co., Nevada. Not *Taxidea nevadensis* Butterworth, Univ. California Publ., Bull. Dept. Geol., 10:21, October 3, 1916.

1951. *Taxidea taxus halli* Schantz, Jour. Mamm., 32: 127, February 15, a renaming of *T. t. nevadensis* Schantz.

TAXIDEA TAXUS MONTANA Schantz

1950. *Taxidea taxus montana* Schantz, Jour. Mamm., 31:90, February 21, type from 35 mi. S Dillon, Beaverhead Co., Montana.

TAXIDEA TAXUS MERRIAMI Schantz

1950. *Taxidea taxus merriami* Schantz, Jour. Washington Acad. Sci., 40:92, March 21, type from Banner, Trego Co., Kansas.

TAXIDEA TAXUS KANSENSIS Schantz

1950. *Taxidea taxus kansensis* Schantz, Jour. Mamm., 31:346, August 21, type from 4 mi. SE McLouth, Leavenworth Co., Kansas.

Taxidea taxus berlandieri Baird

1858. *Taxidea berlandieri* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):205, July 14, type from Llano Estacado, Texas, near boundary of New Mexico.

1895. *Taxidea taxus berlandieri*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:256, June 29.

1865. *Taxidea americana* var. *Californica* Gray, Proc. Zool. Soc. London, p. 141, June, type probably from that part of California that in 1833 adjoined México.

1918. *Taxidea taxus phippsi* Figgins, Proc. Colorado Mus. Nat. Hist., 2(2):1, April, type from northeast of Chromo, Archuleta Co., Colorado. Regarded by Hall, Carnegie Inst. Washington Publ., 473:78, November 20, 1936, as a synonym of *T. t. taxus*; Schantz, Jour. Mamm., 30:91, February 21, 1950, regards it as a synonym of *T. t. berlandieri*.

MARGINAL RECORDS.—Colorado: Crested Butte (Warren, 1942:85, as *T. t. phippsi*). Oklahoma: E end Black Mesa (Glass, 1949:28); *14 mi. W Boise City* (*ibid.*); Alva (Blair, 1939:106). Texas: Henrietta (V. Bailey, 1905:184); Mason (*ibid.*); San Antonio (*ibid.*); Mustang Island, 18 mi. S Port Aransas (Baker and Lay, 1938:505). Tamaulipas: Matamoros (Schantz, 1949:302, as *T. t. littoralis*. Coahuila: La Ventura (Schantz, 1949:302, as *T. t. littoralis*). San Luis Potosí: Bledos (Dalquest, 1953b:192). Texas: lower slopes Chisos Mts. (Borell and Bryant, 1942:16). Chihuahua: San Pedro (J. A. Allen, 1881:183). New Mexico: vicinity of Rodeo (Cahalane, 1939:425). Arizona: Peppersauce Canyon (Doutt, 1934:253); Gray's Ranch (Huey, 1942:360); Growler Valley (*ibid.*); Cibola (Grinnell, 1914: 259). California (Grinnell, *et al.*, 1937:365): Bard. Baja California: Laguna Salada, 10 mi. S international boundary (Schantz, 1949:304, as *T. t. hallorani*). California (Grinnell, *et al.*, 1937:365): La Puerta Valley; San Jacinto; Fairmont; 7 mi. E Laws. Nevada (Hall, 1946:227): Rhyolite; Pahranagat Valley. Utah: 3 mi. NW Castle Cliffs, Beaverdam Slope, 3300 ft. (Durrant, 1952:429); Kaiparowits Plateau (*ibid.*); Dry Valley, near La Sal (Schantz, 1950: 91, as *T. t. montana*).

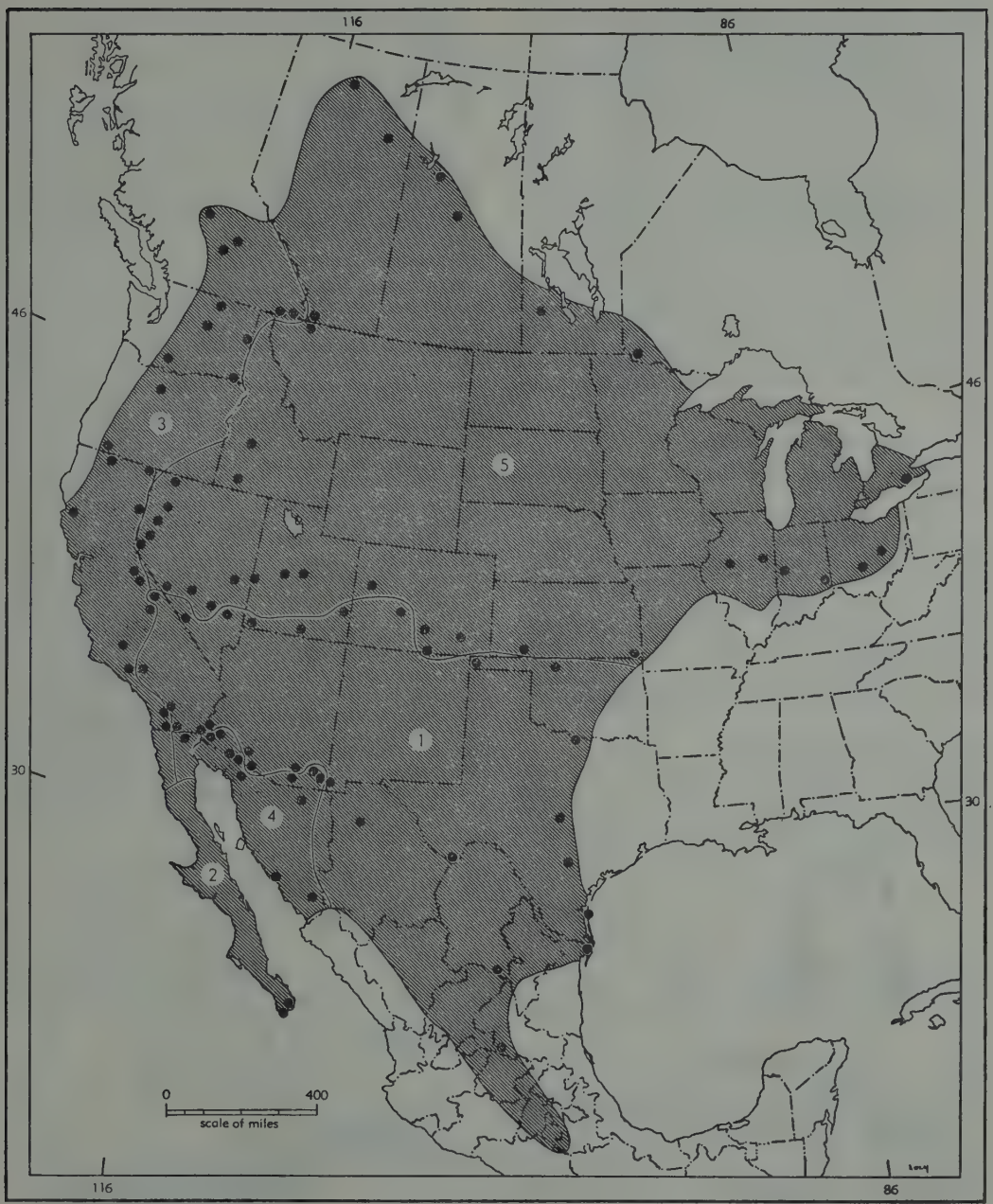
Taxidea taxus infusca Thomas

1898. *Taxidea taxus infusca* Thomas, Proc. Zool. Soc. London, for 1897, p. 899, April, type from Santa Anita, Baja California.

MARGINAL RECORDS.—Baja California: type locality; Cape St. Lucas (Coues, 1877:289, as *T. americana berlandieri*).

Taxidea taxus neglecta Mearns

1891. *Taxidea americana neglecta* Mearns, Bull. Amer. Mus. Nat. Hist., 3:250, June 5, type from Fort Crook, Shasta Co., California.



Map 471. *Taxidea taxus.*

1. *T. t. berlandieri* 2. *T. t. infusca* 3. *T. t. neglecta* 4. *T. t. sonoriensis* 5. *T. t. taxus*

1901. *Taxidea taxus neglecta*, Miller and Rehn, Proc. Boston Soc. Nat. Hist., 30:218, December 27.

MARGINAL RECORDS.—British Columbia: Deep Creek near Kamloops (Cowan and Guiguet, 1956:325, as *T. t. taxus*); Black Pines (Anderson, 1947:74); Tobacco Plains, E Newgate (*ibid.*); Meadow Creek near Yahk, a few miles N Idaho-Montana corner (*ibid.*). Washington: Spokane (Taylor and Shaw, 1929:12); Blue Mts. (Dice, 1919:12). California (Grinnell, *et al.*, 1937:361, unless otherwise noted): Parker Creek; Calneva; Tuolumne Meadows, Yosemite National Park; Mammoth (A. B. Howell, 1924:28); Kern Canyon (Sumner and Dixon, 1953:339); Bakersfield; Mt. Piños; Colton; Witch Creek. Baja California: *lat. 31°, 31′ N* (Hall, 1936:78), thence northward along Pacific Coast to California: Eden Valley Ranch, Mendocino Co. (Grinnell, *et al.*, 1937:361); Butte Creek (*ibid.*). Oregon (V. Bailey, 1936:305): upper Rogue River Valley; Antelope. Washington: Divide above Trout Lake (Dalquest, 1948:220, as *T. t. taxus*); Lakeside (*ibid.*); Loomis (Taylor and Shaw, 1929:12). British Columbia: Kamloops (Anderson, 1947:74).

Taxidea taxus sonoriensis Goldman

1939. *Taxidea taxus sonoriensis* Goldman, Jour. Washington Acad. Sci., 29:300, July 15, type from Camoa, Río Mayo, about 15 mi. above Navojoa, Sonora.

MARGINAL RECORDS.—Arizona: Kofa Game Refuge, Castle Dome Mts. (Schantz, 1949:303, as *T. t. hallorani*); Tule Well (*op. cit.*, p. 304, as *T. t. hallorani*); Sierra Pinta (*ibid.*); Fort Lowell (Schantz, 1948:176, as *T. t. apache*); Willcox (*ibid.*); Apache Pass Draw (*ibid.*). Sonora: 25 mi. S Douglas, Arizona (Schantz, 1948:176, as *T. t. apache*); type locality; Guaymas (Burt, 1938:31, as *T. t. berlandieri*); 8½ mi. N Quitovac (Schantz, 1949:304, as *T. t. hallorani*). Arizona: Yuma (Schantz, 1949:304, as *T. t. hallorani*).

Taxidea taxus taxus (Schreber)

1778. *Ursus taxus* Schreber, Die Säugthiere . . . , 3:520. Type locality, Labrador and Hudson Bay (probably southwest of Hudson Bay).

1894. *Taxidea taxus*, Rhoads, Amer. Nat., 28:524, June.

1784. *Meles Taxus* β. *americanus* Boddaert, Elenchus animalium, 1:80, based on skin, lacking legs, from North America.

1788. *Ursus labradorius* Gmelin, Syst. nat., ed. 13, 1:102, a renaming of *Ursus taxus* Schreber.

1825. *Meles jeffersonii* Harlan, Fauna Americana, p. 309. On p. 310 it is stated that badgers of this kind "Inhabit the open plains of Columbia, sometimes those of Missouri, and are sometimes found in the woods."

1878. *Taxidea sulcata* Cope, Proc. Amer. Philos. Soc., 17: 227, type from Oregon Desert, Oregon (Pleistocene age).

1933. *Taxidea marylandica* Gidley and Gazin, Jour. Mamm., 14:352, November 13, type from Cumberland Cave (Pleistocene), Allegany Co., Maryland.

MARGINAL RECORDS.—Alberta (Preble, 1908:229): Peace River, lat. 58°; Athabaska [River] below mouth of Clearwater. Saskatchewan: Isle à la Crosse (*ibid.*); between Sugar Lake and Amyot Lake, Prince Albert National Park (Soper, 1952:22). Manitoba: W of Buck and Whitewater lakes, Riding Mtn. National Park (Soper, 1953:19). Ontario: N shore Knife Lake, Quetico Provincial Park (Cahn, 1937:24), thence along S shore Lake Superior and Lake Huron to Ontario: near Port Dover (Snyder, 1935: 136). Ohio: W part Pike Township, Knox Co. (Leedy, 1947:290); Columbus (Schantz, 1953:388, as *T. t. jacksoni*). Indiana (Lyon, 1936:133): Franklin County; Vermillion County. Illinois: a few miles N Urbana (Cory, 1912:349); *near Kaskaskia River* (*ibid.*); 2 mi. N Bluff City (E. Anderson, 1951:170). Kansas (Cockrum, 1952:254): Cherokee County; 13 mi. SW Meade. Colorado: Las Animas (Cary, 1911:182); near Antonito (*ibid.*); Russell Springs, near Monte Vista (Schantz, 1950:91, as *T. t. montana*); valley of the Grand [River] (Cary, 1911:182). Utah (Durrant, 1952:428): Wales, 5000 ft.; Deseret; near Garrison. Nevada (Hall, 1946:227): Cave Valley, 3 mi. W Cave, 6500 ft.; Kawich Valley, 3 mi. SE Kawich, 6000 ft.; 9¾ mi. E Goldfield, 5500 ft.; Cave Spring, 6200–6248 ft.; Marlette Lake; 6 mi. NE Virginia City, 6000 ft.; E shore Pyramid Lake, 4000 ft.; 7 mi. NE Gerlach, 3925 ft.; 38 mi. W, 6 mi. S Denio, Oregon. Idaho (Davis, 1939:143): 1 mi. S Riddle; Salmon River Mts. Montana: Blackfoot (Schantz, 1950: 91, as *T. t. montana*). Alberta: Waterton Lakes National Park (Banfield, 1950:26).

Fig. 495. *Taxidea taxus taxus*, Spring Valley, White Pine Co., Nevada, No. 41467 M.V.Z., ♂, X ¾.

Genus Spilogale Gray—Spotted Skunks

Revised by A. H. Howell, N. Amer. Fauna, 26:1–55, 10 pls., November 24, 1906.

1865. *Spilogale* Gray, Proc. Zool. Soc. London, p. 150, June. Type, *Mephitis interrupta* Rafinesque.

Ext. measurements: ♂ 240–563, 72–219, 33–56; ♀ 182–544, 68–204, 34–47. Basilar length, ♂ 35–56; ♀ 34–39. Pelage black with 4 to 6 white stripes, in some subspecies broken into spots on upper parts; tail-vertebrae shorter than head and body; skull flattened in longitudinal dorsal outline, of nearly equal height in frontal and parietal regions; mastoid bullae highly inflated; occiput widened and shallow; posterior margin of palate nearly on a line with posterior borders of upper molars; inferior margin of mandible relatively straight; "step" of *Mephitis* absent, or less developed in *S. gracilis lucasana*; anterior and posterior borders of M1 each less than outside length of P4; in m1 trigonid longer than talonid, metaconid high and distinct from protoconid, hypoconid low, entoconid low and separated from metaconid by wide notch. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{1}{2}$

Most workers are of the opinion that the genus *Spilogale* is monotypic, or has, at most, 2 or 3 species. We employ the existing nomenclature, recording 4 nominal species, and have not prepared a key to the species.

Spotted skunks are found in a variety of habitats: rocky outcrops, chaparral, palmetto scrub, and barnyards. Unlike the other skunks, the spotted skunk climbs well, and may have its den in a tree, although a crevice among rocks or an underground burrow is used more commonly. In the southwest they are reputed to carry rabies invariably, and have earned the sobriquet "hydrophobia skunk" or "phoby skunk," but there is no evidence that spotted skunks carry this disease to a greater extent than the other carnivores. Spotted skunks probably breed in early spring and the young (2–6) are born in early summer. In southern parts of the range, a 2nd litter may be born at the end of summer.

Spilogale putorius
Eastern Spotted Skunk

See characters of the genus.

The scent of this and other species of the genus is "keener" and has more of a "bite" to it than does the mellower scent of the striped skunk.

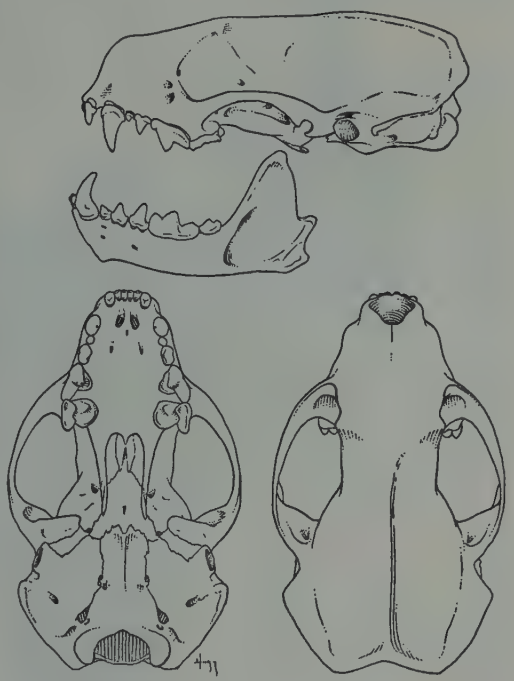


Fig. 496. *Spilogale putorius interrupta*, 1½ mi. N Fowler, Meade Co., Kansas, No. 14237 K.U., ♂, X 1.

Spilogale putorius ambarvalis Bangs

1898. *Spilogale ambarvalis* Bangs, Proc. Boston Soc. Nat. Hist., 28:222, March, type from Oak Lodge, opposite Micco, Brevard Co., Florida.
1953. *Spilogale putorius ambarvalis*, Van Gelder, Jour. Mamm., 34:255, May 14.

MARGINAL RECORDS (Sherman, 1937:111, unless otherwise noted).—Florida: New Smyrna, thence southward along coast to Coconut Grove, Lemon City; 25 mi. SE Immokalee; Palma Sola; Kissimmee Prairie (A. H. Howell, 1906:15).

Spilogale putorius indianola Merriam

1890. *Spilogale indianola* Merriam, N. Amer. Fauna, 4:10, October 8, type from Indianola, Matagorda Bay, Texas.
1952. *Spilogale putorius indianola*, Blair, Texas Jour. Sci., 4:246, June 30.

MARGINAL RECORDS.—Texas: Waco (Strecker, 1926: 13); 2 mi. SE Hearne (1921 Univ. Texas Coll.). Louisiana (Lowery, 1936:21): Baton Rouge; Bogalusa, thence along Gulf Coast to Tamaulipas: Sierra de Tamaulipas, 10 mi. W, 2 mi. S Piedra, 1200 ft. (56996 KU); Victoria (A. H. Howell, 1906:20). Texas: San Antonio (*ibid.*); vicinity of Austin (Cuyler, 1924:180).

Map 472. *Spilogale.*

Guide
to kinds

1. S. *putorius ambarvalis*
2. S. *putorius putorius*
3. S. *putorius interrupta*
4. S. *putorius indianola*
5. S. *gracilis amphialus*
6. S. *gracilis gracilis*
7. S. *gracilis latifrons*
8. S. *gracilis lucasana*
9. S. *gracilis martirensis*
10. S. *gracilis microdon*
11. S. *gracilis microrhina*
12. S. *gracilis phenax*
13. S. *gracilis saxatilis*
14. S. *gracilis tenuis*
15. S. *pygmaea albipes*
16. S. *pygmaea australis*
17. S. *pygmaea pygmaea*
18. S. *angustifrons angustifrons*
19. S. *angustifrons celeris*
20. S. *angustifrons elata*
21. S. *angustifrons tropicalis*
22. S. *angustifrons yucatanensis*

Spilogale putorius interrupta (Rafinesque)

1820. *Mephitis interrupta* Rafinesque, Ann. Nat. . . . , 1:3. Type locality, Upper Missouri [River?].
1952. *Spilogale putorius interrupta*, McCarley, Texas Jour. Sci., 4:108, March 30.
1859. *Mephitis quaterlinearis* Winans, [Kansas?] Newspaper, see Coues, Fur-bearing animals: . . . , U.S. Geol. Surv. Territories, Miscl. Publ. 8, pp. 239–240, 1877.

MARGINAL RECORDS.—Minnesota: Sec. 6, Jadis Twp., Roseau Co. (Swanson, 1945:68); St. Louis County (*op. cit.*: 47). Wisconsin: Sec. 25, T.30 N, R.19 W, St. Croix Co. (Scott, 1951:363), thence southward along W shore of Mississippi River to Missouri (Bennitt and Nagel, 1937:121): St. Francois County; Wayne County. Arkansas (Dellinger and Black, 1940:189): Hot Springs. Texas: 5 mi. W Dallas (1 Dallas M.N.H.); 4 mi. N Blum (51739 KU); Brazos (A. H. Howell, 1906:19); 4 mi. W Dumas (76968 UMMZ). Kansas (Cockrum, 1952:259): ¾ mi. N Fowler; 3 mi. SW Wallace. Colorado: Wray (Warren, 1942:78). South Dakota (Schantz, 1953:124): La Creek Refuge, Bennett Co.; Lower Brule; Waubay National Wildlife Refuge, Day Co. Recorded also from an archaeological site in *Illinois: approximately 2 mi. NW Modoc* (Parmalee and Hoffmeister, 1957:261).

Spilogale putorius putorius (Linnaeus)

1758. [*Viverra*] *putorius* Linnaeus, Syst. nat., ed. 10, 1:44. Type locality, South Carolina.
1875. *Spilogale putorius*, Coues, Bull. U.S. Geol. and Geog. Surv. Territories, ser. 2, 1:12.
1890. *Spilogale ringens* Merriam, N. Amer. Fauna, 4:9, October 8, type from Greensborough, Hale Co., Alabama.

MARGINAL RECORDS (A. H. Howell, 1906:18, unless otherwise noted).—Pennsylvania: Sidling Hill Mtn., Fulton Co. (Latham and Studholme, 1947:409). Virginia: near Winchester (*ibid.*); Rappahanock County (Handley and Patton, 1947:135); Roanoke County (*ibid.*). North Carolina: Roan Mtn. South Carolina: Cleora. Georgia: Thomasville (Sherman, 1937:111). Florida: Tallahassee area (*ibid.*). Alabama (A. H. Howell, 1921:38): Mobile. Mississippi (Cook, 1945:74, unless otherwise noted): Hancock County; Pearl River County; Marion County; Claiborne County; Hinds County; Madison County; Webster County; Pontotoc County; Corinth (A. H. Howell, 1906:18). Tennessee (Schultz, 1954:308): eastern half of Henderson County; Carroll County; Henry County. Illinois: Golconda (A. H. Howell, 1910:32). Indiana (Lyon, 1936:122): Posey County; Knox County. Kentucky: Rowan County (Welter and Sollberger, 1939:79). West Virginia: near Huntington (McKeever, 1952:59); Franklin (*ibid.*).

Spilogale gracilis
Western Spotted Skunk

See characters of genus.

Spilogale gracilis amphialus Dickey

1929. *Spilogale phenax amphialus* Dickey, Proc. Biol. Soc. Washington, 42:158, April 4, type from 2½ mi. N ranch house near coast, Santa Rosa Island, Santa Barbara Islands, Santa Barbara Co., California.
1933. *Spilogale gracilis amphialus*, Grinnell, Univ. California Publ. Zool., 40:105, September 26.

MARGINAL RECORDS.—California, Santa Barbara Islands: type locality; Santa Cruz Island (Dickey, 1929:159).

Spilogale gracilis gracilis Merriam

1890. *Spilogale gracilis* Merriam, N. Amer. Fauna, 3:83, September 11, type from Grand Cañon of the Colorado [River], 3500 ft., north of San Francisco Mtn., Arizona.
1890. *Spilogale leucoparia* Merriam, N. Amer. Fauna, 4:11, October 8, type from Mason, Mason Co., Texas. (Regarded as indistinguishable from *Spilogale gracilis gracilis* by Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:332, December 5, 1952.)
1891. *Spilogale phenax arizonae* Mearns, Bull. Amer. Mus. Nat. Hist., 3:256, June 5, type from Fort Verde, Yavapai Co., Arizona. (Regarded as indistinguishable from *Spilogale gracilis gracilis* by Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:332, December 5, 1952.)
1897. *Spilogale ambigua* Mearns, Preliminary diagnoses of new mammals . . . from the Mexican boundary line, p. 3, January 12 (preprint of Proc. U.S. Nat. Mus., 20:460, December 24, 1897), type from Eagle Mountain (about 4 mi. S Monument No. 15, Mexican boundary line), Chihuahua. (Regarded as indistinguishable from *Spilogale gracilis gracilis* by Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:332, December 5, 1952; regarded as valid under the name *Spilogale putorius ambigua* by Hoffmeister and Goodpaster, Illinois Biol. Monogr., 24(1): 74, December 31, 1954.)

MARGINAL RECORDS.—Utah: N Navajo Mtn. Trading Post (Durrant, 1952:434). New Mexico: Malpais Spring, Tularosa Basin (Halloran, 1946:157). Texas: Mason (A. H. Howell, 1906:21); Waring (*ibid.*); Mico (51650 KU); San Diego (Hall, 1938:514). Nuevo León: Monterrey (A. H. Howell, 1906:21). San Luis Potosí: Hda. Capulín (Dalquest, 1953b:197). Coahuila (A. H. Howell, 1906:21): Sierra Encarnación; W foot Pico de Jimulco, 4700 ft. (56993 KU). Chihuahua: Chihuahua (*op. cit.*, p. 25); Colonia García (*op. cit.*, p. 23). Sonora: Sierra de San José (Burt, 1938:30). Arizona: Miller Canyon, Huachuca Mts. (Hoffmeister and Goodpaster, 1954:74); Bates Well, Organ Pipe Cactus National Monument (Huey, 1942:360). California: near Pilot Knob (Grinnell, *et al.*, 1937:304); 5 mi. NE Granite Well (Johnson, *et al.*, 1948: 344–345); Carroll Creek, Inyo Co. (Grinnell, *et al.*, 1937: 304); Panamint Mts. (A. H. Howell, 1906:23). Nevada (Hall, 1946:204): ¼ mi. W Willow Creek; St. Thomas. Arizona: type locality.

Spilogale gracilis latifrons Merriam

1890. *Spilogale phenax latifrons* Merriam, N. Amer. Fauna, 4:15, October 8, type from Roseburg, Douglas Co., Oregon.
1933. *Spilogale gracilis latifrons*, Grinnell, Univ. California Publ. Zool., 40:106, September 26.
1899. *Spilogale olympica* Elliot, Field Columb. Mus., Publ. 32, Zool. Ser., 1:270, May 19, type from Lake Sutherland, Olympic Mts., Clallam Co., Washington.

MARGINAL RECORDS.—British Columbia (Anderson, 1947:72, as *S. p. olympica*): Alta Lake, 70 mi. N Vancouver; Huntingdon. Washington (Dalquest, 1948:215): Hamilton; Lake Keechelus; Carson. Oregon (A. H. Howell, 1906:33):

Mt. Hood. California: Hornbrook (*ibid.*); Carlottta (Grinnell, *et al.*, 1937:302), thence northward along coast to British Columbia: Howe Sound (Anderson, 1947:72, as *S. p. olympica*).

Spilogale gracilis lucasana Merriam

1890. *Spilogale lucasana* Merriam, N. Amer. Fauna, 4:11, October 8, type from Cape St. Lucas, Baja California.
1952. *Spilogale gracilis lucasana,* Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:335, December 5.

MARGINAL RECORDS.—Baja California: Santa Anita (A. H. Howell, 1906:35); type locality.

Spilogale gracilis martirensis Elliot

1903. *Spilogale arizonae martirensis* Elliot, Field Columb. Mus., Publ. 74, Zool. Ser., 3:170, May 7, type from Vallecitos, San Pedro Mártir Mts., Baja California.
1952. *Spilogale gracilis martirensis,* Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:335, December 5.

MARGINAL RECORDS (A. H. Howell, 1906:31).—Baja California: type locality; San Pedro; San Ignacio; Mulejé.

Spilogale gracilis microdon A. H. Howell

1906. *Spilogale microdon* A. H. Howell, N. Amer. Fauna, 26:34, November 24, type from Comondú, Baja California. Known only from the type locality.
1952. *Spilogale gracilis microdon,* Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:335, December 5.

Spilogale gracilis microrhina Hall

1926. *Spilogale phenax microrhina* Hall, Jour. Mamm., 7:53, February 12, type from Julian, San Diego Co., California.
1933. *Spilogale gracilis microrhina,* Grinnell, Univ. California Publ. Zool., 40(2):105, September 26.

MARGINAL RECORDS.—California (Grinnell, *et al.*, 1937:299, unless otherwise noted): Matilija; San Bernardino Peak (Hall and Kelson, 1952:335); Carrizo Creek, Santa Rosa Mts.; La Puerta (Hall and Kelson, 1952:335); Dulzura (*ibid.*), thence northward along coast to Ventura.

Spilogale gracilis phenax Merriam

1890. *Spilogale phenax* Merriam, N. Amer. Fauna, 4:13, October 8, type from Nicasio, Marin Co., California.
1933. *Spilogale gracilis phenax,* Grinnell, Univ. California Publ. Zool., 40:105, September 26.

MARGINAL RECORDS.—California (A. H. Howell, 1906:32, unless otherwise noted): Baird; Paine's Creek; 600 ft., Tehama Co. (Grinnell, *et al.*, 1937:298); Auburn; Yosemite Valley, Mariposa Co. (Grinnell, *et al.*, 1937:298); Kings River Canyon (*ibid.*); Kern River Lakes; Bodfish (Grinnell, *et al.*, 1937:298); San Emigdio; Santa Ynez Mission, thence northward along coast to Rio Dell; Helena (Grinnell, *et al.*, 1937:298).

Spilogale gracilis saxatilis Merriam

1890. *Spilogale saxatilis* Merriam, N. Amer. Fauna, 4:13, October 8, type from Provo, Utah Co., Utah.
1906. *Spilogale gracilis saxatilis,* A. H. Howell, N. Amer. Fauna, 26:23, November 24.

MARGINAL RECORDS.—Washington: Kamiak Butte (Rust, 1946:315). Idaho: 4 mi. SW Selway Falls, 5800 ft. (Orr, 1943:523). Montana: Tin Cup Canyon, Ravalli Co. (Jellison, 1931:314). Idaho: Justic Park (Davis, 1939:141). Wyoming: Story (63190 KU). Colorado: 35 mi. below Baggs Crossing (Cary, 1911:181); Glenwood Springs (*ibid.*); Salida (Warren, 1942:80, as *S. arizonae*); vicinity of Bayfield (Cary, 1911:181); Ashbaugh's Ranch (Cary, 1911:181). Utah: Zion National Park (Durrant, 1952: 433); St. George (*ibid.*). Nevada (Hall, 1946:203): 1 mi. W Smith Creek Cave, Mt. Moriah, 6000 ft.; Potts; Millett P.O.; Stanmoore Mine, 7550 ft.; Mt. Grant. California: Lake Tahoe, near Tahoe City (Grinnell, *et al.*, 1937:303). Oregon: The Dalles (V. Bailey, 1936:312, map). Washington: Almota (Rust, 1946:315).

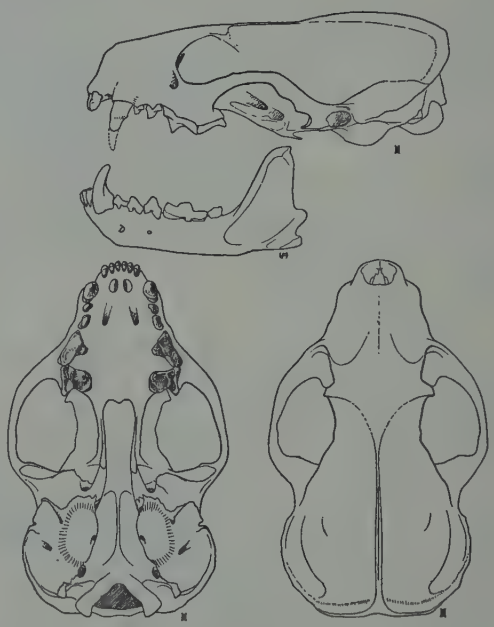


Fig. 497. *Spilogale gracilis saxatilis,* W side Ruby Lake, 6 mi. N Elko Co. line, Nevada, No. 48058 K.U., ♂, X 1.

Spilogale gracilis tenuis A. H. Howell

1902. *Spilogale tenuis* A. H. Howell, Proc. Biol. Soc. Washington, 15:241, December 16, type from Arkins, Larimer Co., Colorado.
1952. *Spilogale gracilis tenuis,* Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:33, December 5.

MARGINAL RECORDS.—South Dakota (Schantz, 1953: 124–125, tentatively assigned to *S. g. tenuis*): Perkins County; near Elk Mtn., Black Hills. Colorado (Warren, 1942:80, unless otherwise noted): type locality; Boulder; Colorado Springs; Furnace Canyon, Baca Co. (Hall, 1946: 203). New Mexico: Oak Canyon, near Folsom (V. Bailey,

1932:341); vicinity of Cimarron (Hill, 1942:78). Colorado: near Mosca Pass (Cary, 1911:180); 20 mi. S Lake George (Hall, 1946:203); South Park (*ibid.*); Estes Park (Warren, 1942:80).

Spilogale pygmaea
Pygmy Spotted Skunk

See characters of genus.

Spilogale pygmaea albipes Goodwin

1956. *Spilogale pygmaea albipes* Goodwin, Amer. Mus. Novit., 1757:13, March 8, type from Las Cuevas, in the valley of and on the eastern side of the Río Tehuantepec, 17 km. NW of the city of Tehuantepec, Oaxaca. Known only from the type locality.

Spilogale pygmaea australis Hall

1938. *Spilogale pygmaea australis* Hall, Ann. Mag. Nat. Hist., ser. 11, 1:514, May, type from Acapulco, Guerrero. Known only from the type locality.

Spilogale pygmaea pygmaea Thomas

1898. *Spilogale pygmaea* Thomas, Proc. Zool. Soc. London, p. 898, for 1897, April, type from Rosario, Sinaloa. Known only from the type locality.

Spilogale angustifrons
Southern Spotted Skunk

See characters of genus.

Spilogale angustifrons angustifrons A. H. Howell

1902. *Spilogale angustifrons* A. H. Howell, Proc. Biol. Soc. Washington: 15:242, December 16, type from Tlalpam [= Tlalpan], Distrito Federal.

MARGINAL RECORDS (Hall and Kelson, 1952:329, unless otherwise noted).—Jalisco: Lagos. Guanajuato: Santa Rosa (A. H. Howell, 1906:26). Hidalgo: Tulancingo. Morelos: Yautepec (A. H. Howell, 1906:26). Guerrero: Chilpancingo (81438 UMMZ). Michoacán: Pátzcuaro. Jalisco: 21 mi. SW Guadalajara, 5100 ft. (40175 KU); San Sebastián; Río Ameca (J. A. Allen, 1906:259).

Spilogale angustifrons celeris Hall

1938. *Spilogale angustifrons celeris* Hall, Ann. Mag. Nat. Hist., ser. 11, 1:511, May, type from San Isidro, Costa Rica.

MARGINAL RECORDS.—Costa Rica: vicinity of Alajuela (Goodwin, 1946:436); type locality; Monte Rey, 1100 m., 22 km. S San José (60502 KU).

Spilogale angustifrons elata A. H. Howell

1906. *Spilogale angustifrons elata* A. H. Howell, N. Amer. Fauna, 26:27, November 24, type from San Bartolomé, Chiapas.

MARGINAL RECORDS.—Chiapas: type locality. Honduras: Cantoral (Goodwin, 1942:180). Nicaragua: Jalapa, 4000 ft. (J. A. Allen, 1910:106). Guatemala: Dueñas (Hall, 1938:513). Chiapas: Pinabete (A. H. Howell, 1906:28).

Spilogale angustifrons tropicalis A. H. Howell

1902. *Spilogale angustifrons tropicalis* A. H. Howell, Proc. Biol. Soc. Washington, 15:242, December 16, type from San Mateo del Mar, Oaxaca.

MARGINAL RECORDS (A. H. Howell, 1906:27).—Oaxaca: San Gerónimo; type locality; Tehuantepec.

Spilogale angustifrons yucatanensis Burt

1938. *Spilogale angustifrons yucatanensis* Burt, Occas. Papers Mus. Zool., Univ. Michigan, 384:2, August 27, type from Chichén Itzá, Yucatán.

MARGINAL RECORDS (Gaumer, 1917:231, as *S. putorius*).—Yucatán: Mérida; thence along coast to British Honduras: Orange Walk. Yucatán: Uxmal.

Genus Mephitis É. Geoffroy Saint-Hilaire and G. Cuvier—Striped and Hooded Skunks

Revised under the name *Chincha* by A. H. Howell, N. Amer. Fauna, 20:1–62, 8 pls., August 15, 1901; see also listing of named kinds by Hall, Carnegie Inst. Washington Publ., 473:63–74, November 20, 1936. For discussion of the nomenclature of this genus see A. H. Howell, N. Amer. Fauna, 20:14, August 31, 1901; Proc. Biol. Soc. Washington, 15:1–9, February 18, 1902; N. Amer. Fauna, 26:10–11, November 24, 1906; J. A. Allen, Bull. Amer. Mus. Nat. Hist., 14:325–334, November 12, 1901; Proc. Biol. Soc. Washington, 15:59–66, March 22, 1902; J. A. Allen and others, Science, n. s., 16:114–115, July 18, 1902.

1795. *Mephitis* É. Geoffroy Saint-Hilaire and G. Cuvier, Mag. Encyclopédique, n. s., 2:187. Type, *Viverra mephitis* Schreber.

1842. *Chincha* Lesson, Nouveau tableau règne animal . . . mammifères, p. 67. Type, *Chincha americana* Lesson [= *Viverra mephitis* Schreber], from North America.

1901. *Leucomitra* A. H. Howell, N. Amer. Fauna, 20:39, August 31, 1901. Type, *Mephitis macroura* Lichtenstein. *Leucomitra* was proposed, and so far as known has been used only, as a subgenus.

External measurements of males: 558–800; 184–435; 58–90. Basal length of skull, 56–76. Females smaller, by as much as 15 per cent in several linear measurements. Pelage black with white markings on upper parts. Mastoid bullae relatively uninflated; posterior margin of palate nearly on a line with posterior border of upper molars; anteroposterior and transverse diameters of M1 each about equal to (usually more than) outside length of P4; metaconule of M1 not distinct; in m1, trigonid longer than talonid; metaconid high and distinct from protoconid, hypoconid high, entoconid high and separated from metaconid by deep, wide notch. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{1}{2}$.

KEY TO SPECIES OF MEPHITIS

1. Tympanic bullae small (see Fig. 498); back black or with white areas containing no black hairs. . . . . *M. mephitis*, p. 934
1′. Tympanic bullae large (see Fig. 499); back black or with white areas containing black hairs mixed with the white. *M. macroura*, p. 937

Mephitis mephitis
Striped Skunk

External measurements of males, 575–800, 184–393, 60–90. Basal length, 60.5–76.0. Females smaller, by as much as 15 per cent in some linear measurements. Pelage mostly black; white on top of head and neck, in most individuals white extending posteriorly (usually separating into two stripes), in some individuals over all of top and sides of tail; white areas on body are entirely of white hair (not mixed with black hairs). Tympanic bullae smaller than in *Mephitis macroura* (see Figs. 498 and 499).

The striped skunk feeds on a variety of vegetable- and animal-foods. In summer many insects and fruits are eaten, but in winter small mammals and carrion comprise a large portion of the diet. Striped skunks live in burrows, under buildings, and in almost any dry place. Four to 7 young (average, 5) are born in the spring after a gestation period of 63 days.

Mephitis mephitis avia Bangs

1898. *Mephitis avia* Bangs, Proc. Biol. Soc. Washington, 12: 32, March 24, type from San Jose, Mason Co., Illinois.
1936. *Mephitis mephitis avia*, Hall, Carnegie Inst. Washington Publ., 473:65, November 20.

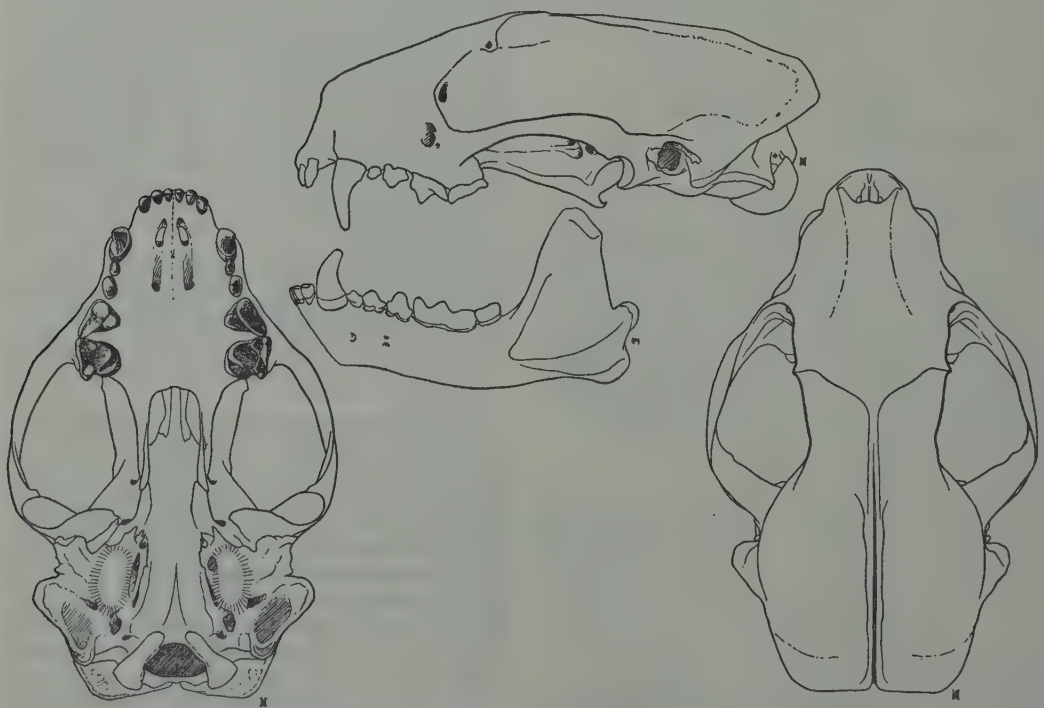


Fig. 498. *Mephitis mephitis major*, 1 mi. SE Lovelock, Pershing Co., Nevada, No. 90562 M.V.Z., ♂, X 1.

1908. *Mephitis mephitica newtonensis* Brown, Mem. Amer. Mus. Nat. Hist., 9(4):175, pl. 16, type from Conard Fissure, Newton Co., Arkansas.

MARGINAL RECORDS.—Iowa: Delaware County (Scott, 1937:63). Wisconsin: near Delavan (Cory, 1912:344). Indiana: Kankakee Valley (Lyon, 1936:129); Fowler (A. H. Howell, 1901:31). Illinois: Charleston (Necker and Hatfield, 1941:47). Kansas (Cockrum, 1952:257): 6 mi. S Garnett; Harvey County; Riley County. Iowa: vicinity of Ames (Selko, 1938:320).

Mephitis mephitis elongata Bangs

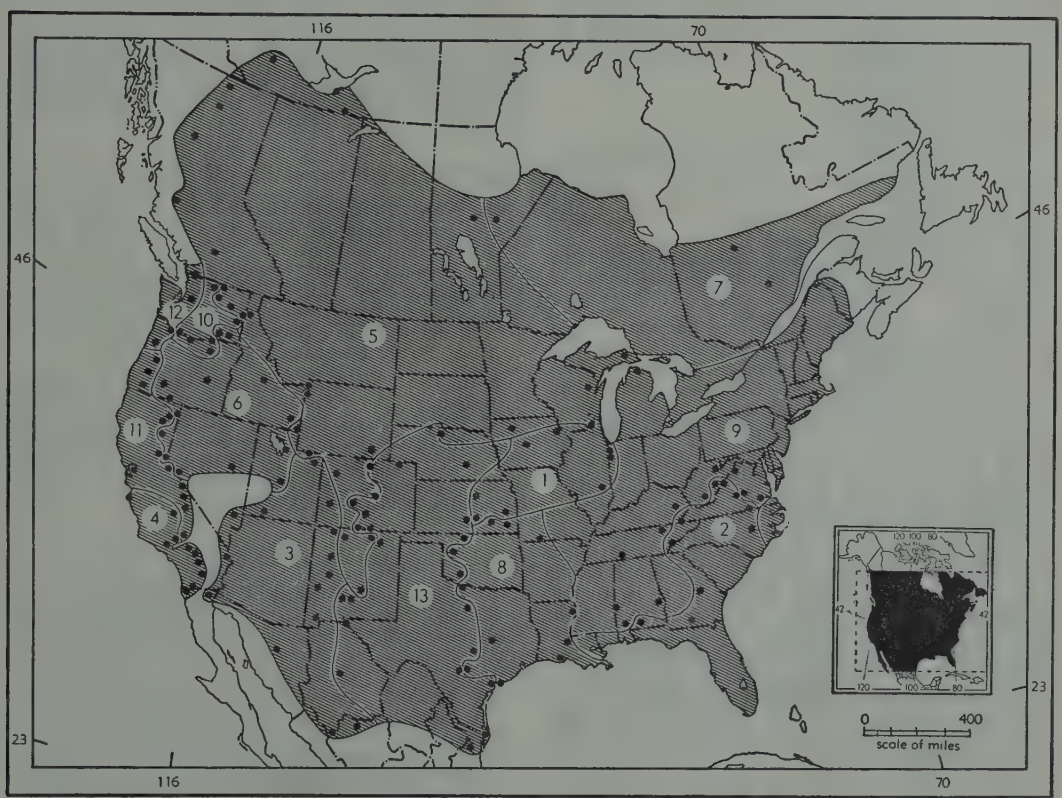
1895. *Mephitis mephitica elongata* Bangs, Proc. Boston Soc. Nat. Hist., 26:531, July 31, type from Micco, Brevard Co., Florida.
1921. *Mephitis mephitis elongata*, Howell, N. Amer. Fauna, 45:39, October 28.

MARGINAL RECORDS.—Virginia (Handley and Patton, 1947:137): Highland County; Buckingham County; Brunswick County. North Carolina: Raleigh (A. H. Howell, 1901:28), southward along Atlantic Coast and along coast of Gulf of Mexico west into Louisiana: "*common east of Mississippi River*" (Lowery, 1936:22). Alabama: Castleberry (A. H. Howell, 1921:39). Georgia (A. H. Howell, 1901:28): Nashville; Pinetucky. Tennessee: Greenbrier (Kellogg, 1939:264). Virginia: Lee County (Handley and Patton, 1947:136). West Virginia: Travellers Repose (Kellogg, 1937:454).

Mephitis mephitis estor Merriam

1890. *Mephitis estor* Merriam, N. Amer. Fauna, 3:81, September 11, type from Little Spring, 8200 ft., N base San Francisco Mt., Coconino Co., Arizona.
1931. *Mephitis mephitis estor*, Hall, Univ. California Publ. Zool., 37:1, April 10.

MARGINAL RECORDS.—Utah: Vernal, 5200 ft. (Durrant, 1952:432). Colorado: around Coventry (Cary, 1911: 179). New Mexico (V. Bailey, 1932:332–334, unless other-



Map 473. *Mephitis mephitis.*

Guide to subspecies
1. *M. m. avia*
2. *M. m. elongata*
3. *M. m. estor*
4. *M. m. holzneri*
5. *M. m. hudsonica*
6. *M. m. major*
7. *M. m. mephitis*
8. *M. m. mesomelas*
9. *M. m. nigra*
10. *M. m. notata*
11. *M. m. occidentalis*
12. *M. m. spissigrada*
13. *M. m. varians*

wise noted): Blanco; San Rafel; Datil; Mogollon; Hachita (A. H. Howell, 1901:33). Durango: Río Sestín (J. A. Allen, 1903:611). Chihuahua: Sierra Madre near Guadalupe y Calvo (A. H. Howell, 1901:34). Sonora: La Noria (Burt, 1938:30). Baja California: Poso Vicente (A. H. Howell, 1901:34). California: 5 mi. below Needles (Grinnell, *et al.*, 1937:321). Nevada: 1 mi. N Rox (Hall, 1946: 214). Utah: Zion National Park (Durrant, 1952:432).

Mephitis mephitis holzneri Mearns

1897. *Mephitis occidentalis holzneri* Mearns, Preliminary diagnoses of new mammals . . . from the Mexican boundary line, p. 4, January 12 (preprint of Proc. U.S. Nat. Mus., 20:461, December 24, 1897), type from San Isidro Ranch, Baja California, within 2 mi. of border of San Diego Co., California.
1933. *Mephitis mephitis holzneri,* Grinnell, Univ. California Publ. Zool., 40:107, September 26.

MARGINAL RECORDS.—California (Grinnell, *et al.*, 1937:317, unless otherwise noted): Monterey (A. H. Howell, 1901:38); Three Rivers (*ibid.*); Weldon; Frazier Mtn.; Oro Grande (Elliot, 1904:316); Seven Oaks; Whitewater; old stage station on Vallecito Creek; Campo. Baja California: type locality.

Mephitis mephitis hudsonica Richardson

1829. *Mephitis americana* var. *hudsonica* Richardson, Fauna Boreali-Americana, 1:55. Type locality, plains of the Saskatchewan, Canada.
1934. *Mephitis mephitis hudsonica,* Hall, Univ. California Publ. Zool., 40:368, November 5.
1911. *Mephitis minnesotae* Brass, Aus dem Reiche der Pelze, p. 532, April. Type locality, forested region of Minnesota.

MARGINAL RECORDS.—Mackenzie: Simpson (Anderson, 1947:73); Great Slave Lake (A. H. Howell, 1901:25); Fort Smith (Harper, 1932:24). Manitoba: central Manitoba (Anderson, 1947:73). Michigan: Chippewa County (Burt, 1946:150). Wisconsin: near Keshena Falls (Komarek, 1932: 206); near Delavan (Cory, 1912:340). Iowa: Palo Alto County (Scott, 1937:62). Nebraska: Johnstown (A. H. Howell, 1901:25). Wyoming: Fort Laramie (*ibid.*). Colorado (Cary, 1911:178): Arkins; Colorado Springs. New Mexico (V. Bailey, 1932:335): Moreno Valley on E slope Taos Pass at 7800 ft.; Capitan Mts.; Lake Burford (Stinking Springs Lake). Colorado: Meeker (Cary, 1911:178). Utah: Sheep Creek (Durrant, 1952:431). Idaho: E side Bear Lake (Davis, 1939:142). Wyoming (A. H. Howell, 1901:25): Lower Geyser Basin; Shoshone Lake. Idaho: Coeur d'Alene (Davis, 1939:142). Washington: Spangle (Taylor and Shaw, 1929:12); Fort Spokane (A. H. Howell, 1901:25); Timentwa (Dalquest, 1948:218); Oroville (*ibid.*). British Columbia: Ashcroft (A. H. Howell, 1901:25); Lonesome Lake (Cowan and Guiguet, 1956:328); Bear Lake (*ibid.*); Tuchodi Lake (*ibid.*); junction of Liard and Nelson rivers (Anderson, 1947:73).

Mephitis mephitis major (A. H. Howell)

1901. *Chincha occidentalis major* A. H. Howell, N. Amer. Fauna, 20:37, August 31, type from Fort Klamath, Klamath Co., Oregon.
1931. *Mephitis mephitis major,* Hall, Univ. California Publ. Zool., 37:1, April 10.

MARGINAL RECORDS.—Washington: Prescott (Taylor and Shaw, 1929:12). Idaho (Davis, 1939:142): Salmon River Mts.; junction of Ross Fork Creek and Portneuf River. Utah (Durrant, 1952:431): 3 mi. W Woods Cross, 4343 ft.; Ephraim. Nevada (Hall, 1946:212): Hamilton; 1 mi. NW Wichman. California (Grinnell, *et al.*, 1937:320): Tahoe City; Spaldings' on Eagle Lake; Dry Creek. Oregon: Tule Lake (A. H. Howell, 1901:38); type locality; Harney (A. H. Howell, 1901:38). Washington: *Wallula* (Taylor and Shaw, 1929:12); Burbank (Dalquest, 1948:218).

Mephitis mephitis mephitis (Schreber)

1776. *Viverra mephitis* Schreber, Die Säugthiere . . . , Theil 3, Heft 17, pl. 121. Type locality, eastern Canada [= Quebec].
1902. *Mephitis mephitis,* J. A. Allen *et al.*, Science, n.s., 16:115, July 18.
1792. *Viverra mephitica,* Shaw, Museum Leverianum . . . , p. 171. Type locality, unknown.
1818. *Mephitis americana* Desmarest, Nouv. Dict. Hist. Nat., Paris, 21:514, a composite species.

MARGINAL RECORDS.—Manitoba: Oxford House (Anderson, 1947:72). Quebec: Mistassini Post (Cameron and Morris, 1951:125). *N shore Gulf of St. Lawrence* (Anderson, 1947:72). *New Brunswick* (*ibid.*). Quebec: Lake Edward (A. H. Howell, 1901:23).

Mephitis mephitis mesomelas Lichtenstein

1832. *Mephitis mesomelas* Lichtenstein, Darstellung neuer oder wenig bekannter Säugethiere . . . , pl. 45, fig. 2. Type locality, Louisiana.
1936. *Mephitis mephitis mesomelas,* Hall, Carnegie Inst. Washington Publ. 473:66, November 20.
1896. *Mephitis mephitica scrutator* Bangs, Proc. Biol. Soc. Washington, 10:141, December 28, type from Cartville, Acadia Parish, Louisiana.

MARGINAL RECORDS.—Kansas (Cockrum, 1952:257): Hamilton; Neosho Falls. Missouri: Marble Cave (Black, 1936:31). Louisiana (Lowery, 1943:233): Tallulah; Melville; Abbeville. Texas: O'Connorport (V. Bailey, 1905: 201); San Antonio (A. H. Howell, 1901:30); Brazos County (Peterson, 1946:166); Wichita Falls (V. Bailey, 1905:201). Oklahoma: Dewey County (Blair, 1939:106).

Mephitis mephitis nigra (Peale and Palisot de Beauvois)

1796. *Viverra nigra* Peale and Palisot de Beauvois, A scientific and descriptive catalogue of Peale's museum, Philadelphia, p. 37. Type locality, Maryland.
1921. *Mephitis mephitis nigra,* A. H. Howell, N. Amer. Fauna, 45:39, October 28.
1839. *Mephitis americana bivirgata* Hamilton-Smith, The naturalist's library (edit. Jardine), Mamm., 1:196. Type locality, unknown.
1842. *Mephitis putida* Boitard, Jardin des Plantes, Mamm., p. 147. Type locality, New Jersey.
1842. *Mephitis olida* Boitard, Jardin des Plantes, Mamm., p. 147. Type locality, unknown.
1842. *Mephitis fetidissima* Boitard, Jardin des Plantes, Mamm., p. 147. Type quality, unknown.
1875. *Mephitis frontata* Coues, Bull. No. 1, U.S. Geol. and Geogr. Surv. Territories, p. 7, fig. 1. Type locality, Pennsylvania.

1911. *Mephitis dentata* Brass, Aus dem Reiche der Pelze, p. 533, April. Type locality, from the Alleghenies to Connecticut.

MARGINAL RECORDS.—Quebec: *"southern Quebec along the northern boundaries of New York, Vermont, New Hampshire, and Maine"* (Anderson, 1947:73). Down Atlantic Coast of United States to Virginia (Handley and Patton, 1947:136): Prince George County; Amelia County; Shenandoah County. West Virginia (Kellogg, 1937:454): vicinity of Philippi; Odd, 2900 ft. Kentucky: Quicksand (Hamilton, 1930:309). Tennessee: Highcliff (Kellogg, 1939:263). Alabama (A. H. Howell, 1921:39): Auburn; Jackson; York. Tennessee: Waynesboro (Kellogg, 1939: 263). Michigan: Cheboygan County (Burt, 1946:150).

Mephitis mephitis notata (A. H. Howell)

1901. *Chincha occidentalis notata* A. H. Howell, N. Amer. Fauna, 20:36, August 31, type from Trout Lake, Mount Adams, Washington.
1936. *Mephitis mephitis notata,* Hall, Carnegie Inst. Washington Publ. 473:67, November 20.

MARGINAL RECORDS.—Washington (Taylor and Shaw, 1929:12): Loomis; Rock Lake. Oregon (V. Bailey, 1936: 311): Umatilla; Lena; Millers near mouth of Deschutes River. Washington: Skamania (Taylor and Shaw, 1929:12).

Mephitis mephitis occidentalis Baird

1858. *Mephitis occidentalis* Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):194, July 14, type from Petaluma, Sonoma Co., California.
1933. *Mephitis mephitis occidentalis,* Grinnell, Univ. California Publ. Zool., 40:106, September 26.
1901. *Chincha platyrhina* A. H. Howell, N. Amer. Fauna, 20:39, August 31, type from South Fork of Kern River, 3 mi. above Onyx, California.

MARGINAL RECORDS.—Oregon (V. Bailey, 1936, fig. 76): Eugene; Roseburg; Grants Pass. California (A. H. Howell, 1901:35, unless otherwise noted): Pitt River; Big Valley Mts.; Blue Canyon; *Lake Tahoe*; Hope Valley; Farrington's Ranch (Grinnell, *et al.*, 1937:316); near Laws (*ibid.*); near Independence (*ibid.*); S Fork Kern River, 25 mi. E Kernville (A. H. Howell, 1901:39); Walnut Creek.

Mephitis mephitis spissigrada Bangs

1898. *Mephitis spissigrada* Bangs, Proc. Biol. Soc. Washington, 12:31, March 24, type from Sumas, British Columbia.
1936. *Mephitis mephitis spissigrada,* Hall, Carnegie Inst. Washington, Publ. 473:67, November 20.
1899. *Mephitis foetulenta* Elliot, Field Columb. Mus., Publ. 32, Zool. Ser., 1:269, May 17, type from Lagune, near Port Angeles, Clallam Co., Washington.

MARGINAL RECORDS.—British Columbia: Huntingdon (Anderson, 1947:73). Washington (Dalquest, 1948:219): Skyomish; Washougal River. Oregon: McCoy (V. Bailey, 1936:310), thence to and up coast to opposite point of beginning.

Mephitis mephitis varians Gray

1837. *Mephitis varians* Gray, Charlesworth's Mag. Nat. Hist., 1:581. Type locality, Texas.
1936. *Mephitis mephitis varians,* Hall, Carnegie Inst. Washington, Publ. 473:66, November 20.

MARGINAL RECORDS.—Nebraska (A. H. Howell, 1901:32): Valentine; Johnstown; Loup Fork River. Kansas: 2 mi. N, 2 mi. E Hutchinson (Cockrum, 1952:256). Oklahoma (Blair, 1939:106): Alva; Wichita National Forest. Texas: Brazos (V. Bailey, 1905:201); vicinity of Austin (Selko, 1938:323); San Antonio (V. Bailey, 1905:201); Indianola (A. H. Howell, 1901:32). Tamaulipas: Matamoros (*ibid.*); 2 mi. up stream from Marmolejo (Dice, 1937: 250). Chihuahua: 11 mi. S, 1 mi. E Encinillas (54823 KU). Texas: El Paso (V. Bailey, 1905:202). New Mexico: Mtn. (Mud) Tank (Halloran, 1946:157); Tularosa (Blair, 1941:220); *Hall Peak* (A. H. Howell, 1901:32); vicinity of Cimarron (Hill, 1942:78). Colorado (Cary, 1911:178–179): Costilla County; Antonito; Gardner; Conrow; *Cripple Creek*; Colorado Springs; Arkins; Sterling.

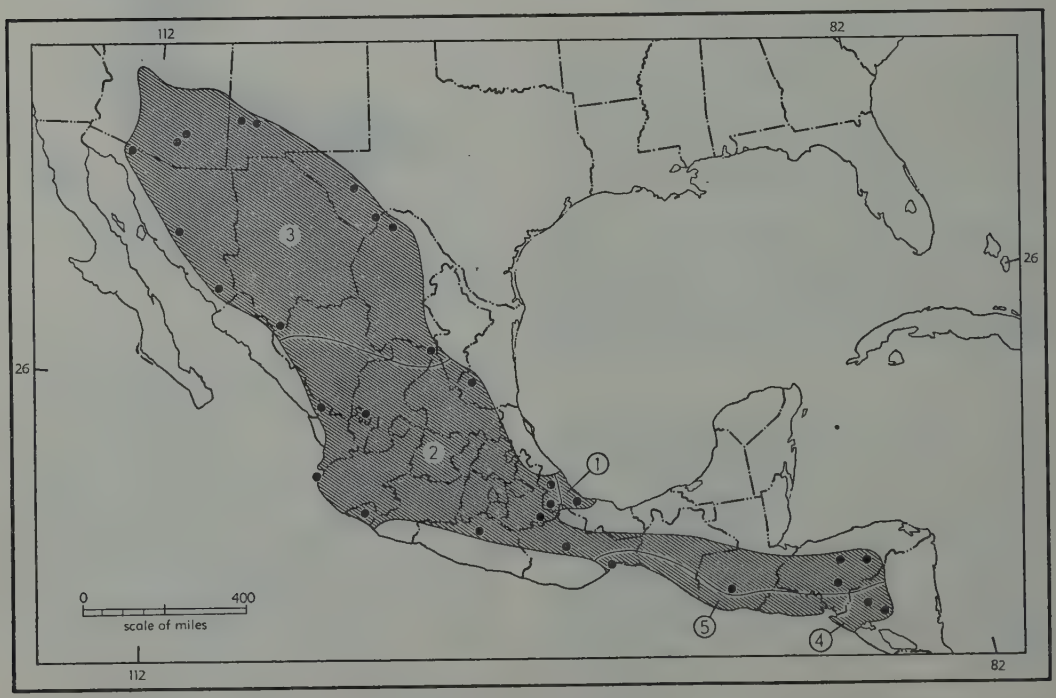
Mephitis macroura
Hooded Skunk

External measurements of males: 558–790; 275–435; 58–73. Basilar length of skull, 56.1–60.3. Females smaller, by as much as 15 per cent in some linear measurements. Pelage black usually with white on upper parts. This species can be distinguished from *M. mephitis* by larger tympanic bullae (see Figs. 498 and 499); in the white-backed color phase by having some black hairs mixed with the white hairs of the back, and in the black-backed phase by having the 2 white stripes widely separated and on the sides of the animal instead of narrowly separated and on the back of the animal. The habits of the hooded skunk are little known.

Mephitis macroura eximius Hall and Dalquest

1950. *Mephitis macroura eximius* Hall and Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 1:579, January 20, type from 15 km. W Piedras Negras, 300 ft., Veracruz.

Fig. 499. *Mephitis macroura macroura*, 2 mi. W Pátzcuaro, 7600 ft., Michoacán, No. 100115 M.V.Z., ♂, X 1.



Map 474. *Mephitis macroura.*

Guide to subspecies
1. *M. m. eximius*
2. *M. m. macroura*
3. *M. m. milleri*
4. *M. m. richardsoni*
5. *M. m. vittata*

MARGINAL RECORDS (Hall and Dalquest, 1950:580).—Veracruz: Río Blanco, 20 km. WNW Piedras Negras; *type locality*.

Mephitis macroura macroura Lichtenstein

1832. *Mephitis macroura* Lichtenstein, Darstellung neuer oder wenig bekannter Säugethiere . . . , pl. 46, type from mountains northwest of the City of Mexico.
1837. *Mephitis mexicana* Gray, Charlesworth's Mag. Nat. Hist., 1:581. Type locality, unknown.
1862. *Mephitis longicaudata* Tomes, Proc. Zool. Soc. London, for 1861, p. 280, April, type from Dueñas, Guatemala.
1877. *Mephitis edulis* Coues, Berlandier Mss., Fur-bearing Animals: . . . , U.S. Geol. Surv. Territories, Miscl. Publ., 8:236. Type locality, "Inhabits most of Mexico. I have found it around San Fernando de Bexar . . ."

MARGINAL RECORDS (Hall and Dalquest, 1950:578, unless otherwise noted).—Tamaulipas: Jaumave. Veracruz: Las Vigas; Orizaba. Puebla: Tehuacán. Honduras (Goodwin, 1942:181): El Caliche Orica; Catacamas; Tegucigalpa. Guatemala: vicinity of Dueñas. Oaxaca: 15 mi. W Oaxaca. Guerrero: 22 km. S Taxco, 4000 ft. (Davis, 1944:382). Colima: Hda. Magdalena. Jalisco: San Sebastián. Nayarit: Santa Teresa. Zacatecas: Valparaíso.

Mephitis macroura milleri Mearns

1897. *Mephitis milleri* Mearns, Preliminary diagnoses of new mammals . . . from the Mexican boundary of the United States, p. 1, February 11 (preprint of Proc. U.S. Nat. Mus., 20:467, December 24, 1897), type from Fort Lowell, near Tucson, Pima Co., Arizona.
1901. *Mephitis macroura milleri*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 14:334, November 12.

MARGINAL RECORDS.—New Mexico (V. Bailey, 1932: 336): Gila; about 7 mi. above Mimbres P.O. Texas: 3 mi. N Mt. Livermore (Blair, 1940:24); Black Gap Wildlife Management Area (Tamsitt, 1954:55). Coahuila: Juarez Cañon in Sierra del Carmen (No. 94 F. W. Miller in Dallas, Texas, Museum); La Ventura (Hall and Dalquest, 1950: 578). Chihuahua: mts. near Guadalupe y Calvo (*ibid.*). Sonora (*ibid.*): Camoa; Hermosillo; Sierra Cuababi. Arizona: approx. 15 mi. W Tucson (Reed and Carr, 1949:79); Santa Catalina Mts. (Hall and Dalquest, 1950:578).

Mephitis macroura richardsoni Goodwin

1957. *Mephitis macroura richardsoni* Goodwin, Amer. Mus. Novit., 1830:3, May 3, type from Matagalpa, Nicaragua, 2000 ft.

MARGINAL RECORDS (Goodwin, 1957:3–4).—Nicaragua: San Rafael del Norte; type locality.

Mephitis macroura vittata Lichtenstein

1832. *Mephitis vittata* Lichtenstein, Darstellung neuer oder wenig bekannter Säugethiere . . . , pl. 47, type from San Mateo del Mar, Oaxaca. Known definitely only from area of type locality.
1901. *Mephitis macroura vittata*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 14:334, November 12.
1865. *Mephitis concolor* Gray, Verraux Mss., Proc. Zool. Soc. London, p. 149, June, based on a variety of *M. vittata* Lichtenstein.
1869. *Mephitis vittata* var. *intermedia* Gray, Catalogue of the carnivorous, pachydermatous, and edentate Mammalia in the British Museum, p. 138, based on a variety of *M. vittata* Lichtenstein.

Genus Conepatus Gray—Hog-nosed Skunks

1837. *Conepatus* Gray, Charlesworth's Mag. Nat. Hist., 1: 581, November. Type, *Conepatus humboldtii* Gray.
1837. *Thiosmus* Lichtenstein, Abhandl. preuss. Akad. Wiss., Berlin, for 1836, p. 272. Included 10 species [now in genus *Conepatus* Gray].
1837. *Marputius* Gray, Charlesworth's Mag. Nat. Hist., 1: 581, November. Type, *Mephitis chilensis* É. Geoffroy Saint-Hilaire [= *Viverra chinga* Molina].
1902. *Oryctogale* Merriam, Proc. Biol. Soc. Washington, 15: 161, August 6. Type, *Mephitis leuconata* Lichtenstein.

External measurements: males 513–900; 174–410; 65–90. Condylobasal length of skull, 65.0–83.3; zygomatic breadth, 45.0–76.8. Females are smaller, perhaps by 10 per cent. Pelage black except for white back and tail; depending on the species the back is all white or instead marked with 2 white stripes; the proximal part of the ventral side of the tail is black. Claws on forefeet and bare area around nose pad much larger than in *Mephitis*; 3 or 4 pairs of mammae. Skull deepest in temporal region; mastoid bullae hardly inflated; posterior margin of palate behind upper molars; anteroposterior and transverse diameters of M1 each more than outside length of P4; metaconule of M1 not distinct; inferior margin of lower mandible longitudinally convex; in m1 trigonid shorter than talonid; metaconid high and distinct from protoconid; hypoconid low, entoconid high and separated from metaconid by distinct notch. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{2}{3}$, m. $\frac{1}{2}$.

The principal food of *Conepatus* seems to be insects. The gestation period is believed to be approximately 42 days.

Key to North American Species of Conepatus

1. Tail more than ⅓ of total length; back with one broad white stripe; anterior opening of infraorbital canal single.
   2. White stripe as broad on rump as on shoulders; in M1, outside length less than 7.9 in male and less than 7.2 in female. . . . . *C. mesoleucus*, p. 940
   2′. White stripe narrower (or even absent) on rump than on shoulders; in M1, outside length more than 7.9 in male and more than 7.2 in female. *C. leuconotus*, p. 942
1′. Tail less than ⅓ of total length; back with 2 white stripes united at nape and separated by a black area narrower than either white stripe; each white stripe tapers to a tip on rump; anterior opening of infraorbital canal multiple (double or triple). *C. semistriatus*, p. 942

Conepatus mesoleucus
Hog-nosed Skunk

Maximum external measurements for males are near: 633; 275; 75. Condylobasal length of skull, 72.8; zygomatic breadth, 51.3. Females are smaller, by as much as 10 per cent in some linear measurements. Pelage black except that back and all but proximal part of underside of tail white.

In most populations of this species the white area of the back is continued broadly onto the tail whereas in *Conepatus leuconotus* the white area is only narrowly continuous from the back to the tail. The teeth are smaller in *C. mesoleucus* than in *C. leuconotus*. Actually there is intergradation in the color pattern and we suppose that when specimens are obtained from areas intermediate between the geographic ranges of the two nominal species they will prove to be only subspecifically different.

Conepatus mesoleucus figginsi F. W. Miller

1925. *Conepatus mesoleucus figginsi* F. W. Miller, Jour. Mamm., 6:50, January 9, type from Furnace Canyon, western Baca Co., Colorado.

MARGINAL RECORDS.—Colorado (Warren, 1942:82): Keaton Ranch, Little Fountain Creek, 12 mi. SW Colorado Springs; type locality; near Canyon City.

Conepatus mesoleucus filipensis Merriam

1902. *Conepatus filipensis* Merriam, Proc. Biol. Soc. Washington, 15:163, August 6, type from Cerro San Felipe, Oaxaca. Known only from the type locality.
1952. *Conepatus mesoleucus filipensis*, Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:335, December 5.

Conepatus mesoleucus fremonti F. W. Miller

1933. *Conepatus mesoleucus fremonti* F. W. Miller, Proc. Colorado Mus. Nat. Hist., 12(1):1, July 22, type from Garden Park, near Canon City, Fremont Co., Colorado.

MARGINAL RECORDS.—Colorado: Little Fountain Creek in El Paso Co. (Warren, 1942:83); type locality.

Conepatus mesoleucus mearnsi Merriam

1902. *Conepatus mesoleucus mearnsi* Merriam, Proc. Biol. Soc. Washington, 15:163, August 6, type from Mason, Mason Co., Texas.
1902. *Conepatus pediculus* Merriam, Proc. Biol. Soc. Washington, 15:164, August 6, type from Sierra Guadalupe, Coahuila. Considered to be inseparable from *C. m.*

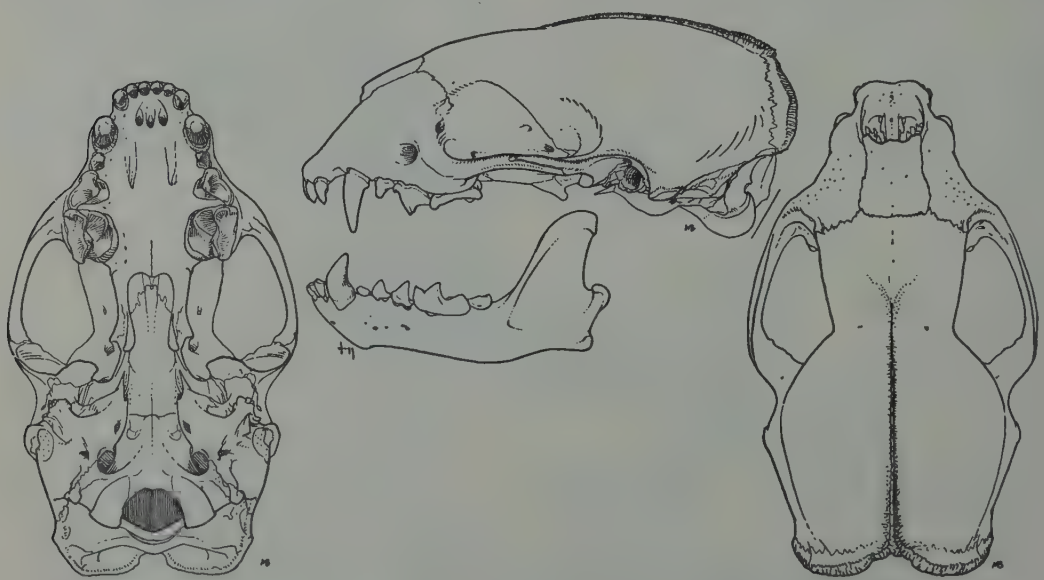
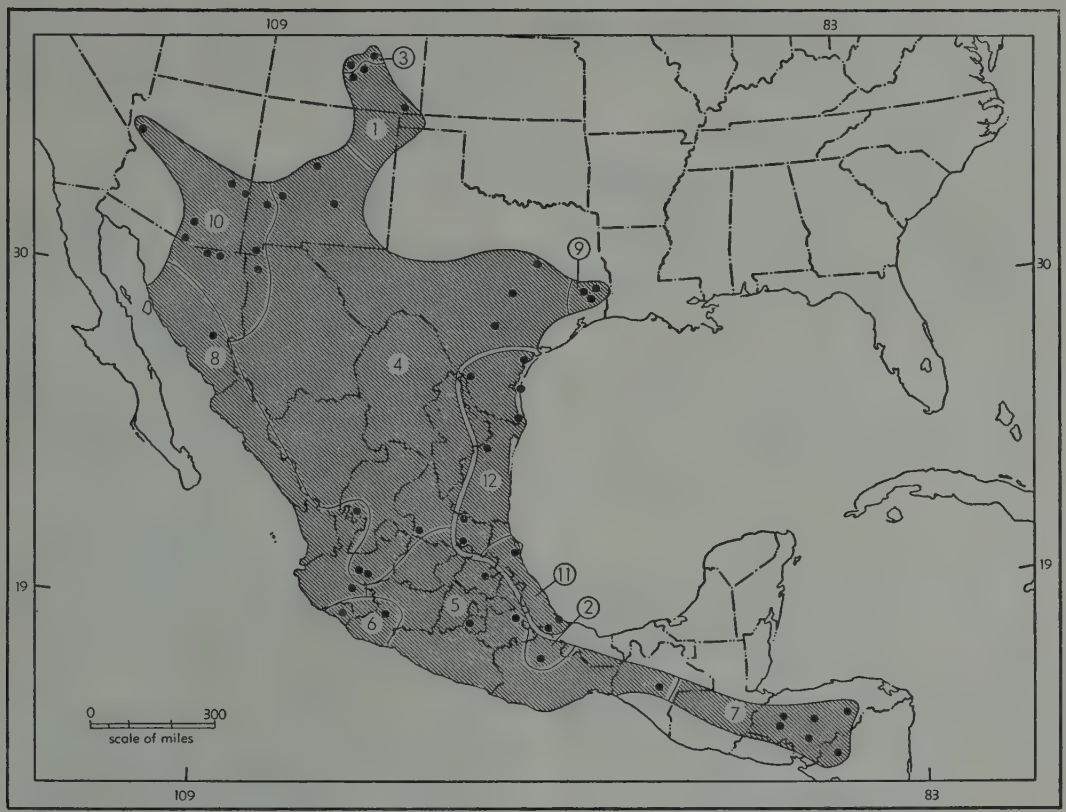


Fig. 500. *Conepatus mesoleucus mearnsi*, E base Burro Mesa, Chisos Mts., Brewster Co., Texas, No. 80336 M.V.Z., ♂, X 1.



Map 475. *Conepatus mesoleucus* and *Conepatus leuconotus.*

1. *C. mesoleucus figginsi*
2. *C. mesoleucus filipensis*
3. *C. mesoleucus fremonti*
4. *C. mesoleucus mearnsi*
5. *C. mesoleucus mesoleucus*
6. *C. mesoleucus nelsoni*
7. *C. mesoleucus nicaraguae*
8. *C. mesoleucus sonoriensis*
9. *C. mesoleucus telmalestes*
10. *C. mesoleucus venaticus*
11. *C. leuconotus leuconotus*
12. *C. leuconotus texensis*

mearnsi by Baker, Univ. Kansas Publ., Mus. Nat. Hist., 9:310, June 15, 1956.

MARGINAL RECORDS.—New Mexico (V. Bailey, 1932: 337): W base Sandia Mts., 18 mi. E Albuquerque; Jicarilla Mts. Texas: Brazos Bottom S of Waco (Strecker, 1924: 15); Llano (V. Bailey, 1905:202); San Antonio (*ibid.*). San Luis Potosí: Hda. la Parda (Merriam, 1902:163). Jalisco (*ibid.*): Zapotlán; Guadalajara. New Mexico: Diamond Creek (Goldman, 1922:40).

Conepatus mesoleucus mesoleucus (Lichtenstein)

1832. *Mephitis mesoleuca* Lichtenstein, Darstellung neuer oder wenig bekannter Säugethiere . . . , pl. 44, fig. 2, type from near Chico, Hidalgo.

1902. [*Conepatus*] *mesoleucus*, Merriam, Proc. Biol. Soc. Washington, 15:163, August 6.

MARGINAL RECORDS.—Hidalgo: type locality. Puebla: Río Otlati, 15 km. NW San Martín, 8700 ft. (Davis, 1944: 382). Chiapas: 17 mi. W Bochil (Booth, 1957:17). Morelos: 2 mi. W Huitzilac (Davis and Russell, 1954:71).

Conepatus mesoleucus nelsoni Goldman

1922. *Conepatus mesoleucus nelsoni* Goldman, Jour. Mamm., 3:41, February 8, type from Armería (near Manzanillo), 200 ft., Colima.

MARGINAL RECORDS.—Colima: *Colima* (Goldman, 1922:41). Michoacán: Tancítaro, 6000 ft. (Hall and Villa, 1950:179). Colima: Hda. Magdalena (Goldman, 1922:41); type locality.

Conepatus mesoleucus nicaraguae J. A. Allen

1910. *Conepatus nicaraguae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 28:106, April 30, type from San Rafael del Norte, Nicaragua.

1946. *Conepatus mesoleucus nicaraguus*, Goodwin, Bull. Amer. Mus. Nat. Hist., 87:437, December 31.

MARGINAL RECORDS.—Honduras (Goodwin, 1942: 181): Cementerio; El Caliche Cedros; Catacamas. Nicaragua: type locality. Honduras (Goodwin, 1942:181): El Zapote, Sabana Grande; Las Flores.

Conepatus mesoleucus sonoriensis Merriam

1902. *Conepatus sonoriensis* Merriam, Proc. Biol. Soc. Washington, 15:162, August 6, type from Camoa, Río Mayo, Sonora.
1952. *Conepatus mesoleucus sonoriensis*, Hall and Kelson, Univ. Kansas Publ., Mus. Nat. Hist., 5:335, December 5.

MARGINAL RECORDS.—Sonora: type locality. Zacatecas: Valparaíso Mts. (Merriam, 1902:162). Jalisco: Los Masos (J. A. Allen, 1906:258).

Conepatus mesoleucus telmalestes V. Bailey

1905. *Conepatus mesoleucus telmalestes* V. Bailey, N. Amer. Fauna, 25:203, October 24, type from Big Thicket, 7 mi. NE Sour Lake, Hardin Co., Texas.

MARGINAL RECORDS (V. Bailey, 1905:204).—Texas: 10 mi. NE Sour Lake; type locality; Tarkington Prairie.

Conepatus mesoleucus venaticus Goldman

1922. *Conepatus mesoleucus venaticus* Goldman, Jour. Mamm., 3:40, February 8, type from Cosper Ranch, Blue River, 12 mi. S Blue, 5000 ft., Greenlee Co., Arizona.

MARGINAL RECORDS (Goldman, 1922:41, unless otherwise noted).—Arizona: about 16 mi. SE Kingman (Musgrove and Hoffmeister, 1957:414); Black River; type locality. New Mexico (V. Bailey, 1932:338): Dry Creek; Animas Valley. Chihuahua: Colonia García. Sonora: San José Mts.; Santa Cruz. Arizona: La Osa; Tucson.

Conepatus leuconotus
Eastern Hog-nosed Skunk

Maximum external measurements for males are near: 900; 410; 90. Condylobasal length of skull, 83.3; zygomatic breadth, 76.8. Females are smaller, by as much as 10 per cent in some linear measurements. The possibility that *C. leuconotus* and *C. mesoleucus* are only subspecifically different is commented on in the account of the latter species.

Conepatus leuconotus leuconotus (Lichtenstein)

1832. *Mephitis leuconata* Lichtenstein, Darstellung neuer oder wenig bekannter Säugethiere . . . , pl. 44, fig. 1, type from Río Alvarado, Veracruz.
1902. *Conepatus leuconotus*, Merriam, Proc. Biol. Soc. Washington, 15:161, August 6.

MARGINAL RECORDS.—Veracruz: Potrero Llano, 350 ft. (29995 KU); type locality; Río Blanco, 20 km. WNW Piedras Negras (17898 KU).

Conepatus leuconotus texensis Merriam

1902. *Conepatus leuconotus texensis* Merriam, Proc. Biol. Soc. Washington, 15:162, August 6, type from Brownsville, Cameron Co., Texas.

MARGINAL RECORDS.—Texas (V. Bailey, 1905:205): Rockport; Padre Island; Brownsville, thence south along Gulf Coast probably into northern Veracruz and San Luis Potosí (Dalquest, 1953b:196): Hda. Capulín; El Salto. Tamaulipas: near El Mulato (Dice, 1937:250). Texas: Laredo (V. Bailey, 1905:205).

Conepatus semistriatus
Striped Hog-nosed Skunk

External measurements of males: 533–688; 160–193; 70–82. Condylobasal length of skull, up to at least 78; zygomatic breadth, up to at least 51. Females are smaller by as much as 10 per cent in certain linear measurements. Pelage black except for 2 white stripes on back and white tail. In specimens seen by us the white stripes are absent on the rump or only faintly indicated there. A few black hairs are mixed with the white hairs on the tail. The proximal part of the ventral surface of the tail is black. The white stripes are united on the nape, are separated on the body by a black area narrower than either white stripe, and each white stripe tapers to a point on the hip. From *Conepatus leuconotus* and *C. mesoleucus*, *Conepatus semistriatus* differs cranially as follows: dorsal profile longitudinally uneven (instead of evenly convex) owing to upturned tips of nasals, upward bulge of frontals in interorbital region, and a posterior prominence behind the postorbital constriction; margin of opening of anterior nares more nearly vertical (less oblique); postorbital constriction more pronounced; tympanic bullae less inflated; anterior opening of infraorbital canal double or triple instead of single. The species occurs also in South America.

Map 476. *Conepatus semistriatus.*

Guide to subspecies
1. *C. s. conepatl*
2. *C. s. trichurus*
3. *C. s. yucatanicus*

Fig. 501. *Conepatus semistriatus trichurus*, Pilón de Azucar (Peralta), 500 m., Cartago, Costa Rica, No. 32245 K.U., ♂, X 1.

Conepatus semistriatus conepatl (Gmelin)

1788. [*Viverra*] *conepatl* Gmelin, Syst. nat., ed. 13, 1:88. Type locality, "Nova Hispania" [= Mexico]; restricted to Motzorongo, Veracruz, by Hershkovitz (Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:562, July 10, 1951).
1951. *Conepatus semistriatus conepatl*, Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:562, July 10.
1902. *Conepatus tropicalis* Merriam, Proc. Biol. Soc. Washington, 15:164, August 6, type from Motzorongo, Veracruz.

MARGINAL RECORDS.—Veracruz: type locality, presumably eastward to coast and down coast into Campeche. To westward known from Veracruz: 35 km. SE Jesús Carranza, 400 ft. (24546 KU); *20 km. ENE Jesús Carranza, 200 ft.* (32224 KU); Pasa Nueva (J. A. Allen, 1904:36).

Conepatus semistriatus trichurus Thomas

1902. *Conepatus mapurito* Bangs, Bull. Mus. Comp. Zool., 39:48, April, type from Boquete, Volcán de Chiriquí, Chiriquí, Panamá. Not Gmelin, 1788.
1905. *Conepatus tropicalis trichurus* Thomas, Ann. Mag. Nat. Hist., ser. 7, 15:585, June, a renaming of *Conepatus mapurito* Bangs.
1951. *Conepatus semistriatus trichurus*, Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:562, July 10.

MARGINAL RECORDS (Goodwin, 1946:437).—Costa Rica: Jiménez; *Santa Teresa Peralta.* Panamá: type locality. Costa Rica: Pozo Azul Pirris; *Escazú.*

Conepatus semistriatus yucatanicus Goldman

1943. *Conepatus tropicalis yucatanicus* Goldman, Proc. Biol. Soc. Washington, 56:89, October 1, type from La Vega, on mainland opposite Isla Cancun, Quintana Roo.
1955. *Conepatus semistriatus yucatanicus*, Miller and Kellogg, Bull. U.S. Nat. Mus., 205:761, March 3.

MARGINAL RECORDS.—Quintana Roo: type locality. British Honduras: Stann Creek Valley (Hershkovitz, 1951: 562, under name *C. s. conepatl*); El Cayo (Murie, 1935:21, under name *Conepatus* sp. but possibly not *semistriatus*). Guatemala: *no precise locality* (Goldman, 1943:90). Yucatán: Mérida (*ibid.*).

Genus **Lutra** Brünnich—River Otters

Revised by Pohle, Arch. Naturgesch., 85(Abt. A, No. 9): 1–247, 10 tables, 19 figs. in text, December, 1920.

1762. *Lutra* Brisson, Regnum animale . . . , ed. 2, p. 13. Type, *Mustela lutra* Linnaeus. Brisson's names are regarded as non-Linnaean and as not consistently binomial. See Hopwood, Proc. Zool. Soc. London, 117(2–3):534–535, October 30, 1947, and Hershkovitz, Proc. Biol. Soc. Washington, 62:12, March 17, 1949.
1772. *Lutra* Brünnich, Zoologiae Fundamenta . . . , p. 34, 42. Type, *Mustela lutra* Linnaeus.
1806. *Lutris* Duméril, Zoologie analytique . . . , p. 12, an emendation of *Lutra.*
1815. *Lutrix* Rafinesque, Anal. Nat., p. 59, a renaming of *Lutra.*

1842. *Leptonyx* Lesson, Nouveau tableau du règne animal . . . mammifères, p. 72. Type, *Leptonyx barang* Lesson. Not *Leptonyx* Swainson, 1821, a bird.
1842. *Saricovia* Lesson, Nouveau tableau du règne animal . . . mammifères, p. 72. Type, *Lutra brasiliensis* Zimmermann.
1843. *Lontra* Gray, Ann. Mag. Nat. Hist., ser. 1, 11:118, February. Type, *Lutra canadensis* Schreber.
1843. *Latax* Gray, Ann. Mag. Nat. Hist., ser. 1, 11:119, February. Type, *Lutra lataxina* F. Cuvier. Not *Latax* Gloger, 1827.
1843. *Lataxina* Gray, List of the . . . Mammalia in the . . . British Museum, p. 70. Type, *Lataxina mollis* Gray [= *Lutra lataxina* F. Cuvier].
1855. *Lataxia* Gervais, Histoire naturelle des mammifères . . . , 2:118, a renaming of *Latax* Gray.
1865. *Barangia* Gray, Proc. Zool. Soc. London, p. 123, June. Type, *Lutra sumatrana* Gray.
1865. *Lutrogale* Gray, Proc. Soc. London, p. 127, June. Type, *Lutra perspicillata* I. Geoffroy Saint-Hilaire (misidentified by Gray as *L. monticola* Hodgson).
1865. *Nutria* Gray, Proc. Zool. Soc. London, p. 128, June. Type, *Lutra felina* Molina.
1865. *Hydrogale* Gray, Proc. Zool. Soc. London, p. 131, June. Type, *Lutra maculicollis* Lichtenstein. Not *Hydrogale* Kaup, 1829, a shrew.
1867. *Lutronectes* Gray, Proc. Zool. Soc. London, p. 180, May. Type, *Lutronectes whiteley* Gray [= *Mustela lutra* Linnaeus].
1921. *Hydrictis* Pocock, Proc. Zool. Soc. London, p. 543, September 9. Type, *Lutra maculicollis* Lichtenstein.

Trunk cylindrical; neck about as wide as skull, short; head flattened, rounded; legs short; toes broadly spread, webbed; claws laterally compressed, blunt; tail thick at base, oval in cross-section; ears small, capable of being closed. Skull strongly flattened; muzzle short; braincase broad, long, arched; interorbital breadth less than width of muzzle; infraorbital foramen as large as, or larger than, alveolus of canine; orbit open, postorbital processes varying from large to rudimentary; alisphenoid canal absent; opening of external auditory meatus large; paroccipital process not in contact with bulla. M1 rhomboid, large; P4 with hollowed deuterocone; talonid and trigonid of m1 about equal in length; metaconid large; talonid basined. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{4}{3}$, m. $\frac{1}{2}$

The river otter is an excellent swimmer and diver, and may travel 50 to 60 miles of a streamcourse in a year. In the breeding season a male may travel long distances overland. The food of the otter is crayfish, frogs, turtles, fish, and aquatic invertebrates. The den is in a burrow, a cavity at the root of a tree, or in a thicket of vegetation. Burrows, when used, are generally those of some other animal, for the otter does not dig a den for itself. The breeding season is in winter and early spring. The young, usually 3 (1–4), are born in May in the higher latitudes, and earlier to the south. Liers (1951:6) records gestation periods varying from 9 months 18 days to 12 months 15 days; the young are altricial. Probably delayed implantation occurs, for the gestation period of *Lutra lutra* is known to be 61 to 63 days.

KEY TO NORTH AMERICAN NOMINAL SPECIES OF LUTRA

1. Rhinarium furred laterally; sole of foot naked; skull convex dorsally; occurring south of 25° latitude. . . . . *L. annectens*, p. 948
1′. Rhinarium naked; sole of foot with tufts of hair under toes; skull flat dorsally; occurring north of 25° latitude.
   2. Occurring only on the Alexander Archipelago (Prince of Wales Island and Shrubby Island), Alaska. . . *L. mira*, p. 948
   2′. Not occurring on the Alexander Archipelago. . . . . *L. canadensis*, p. 944

Lutra canadensis

River Otter

External measurements: 889–1300; 300–507; 100–146. Weight, 11–23 lbs. Basal length, 92.9–122.0; zygomatic breadth, 62.0–76.5. Females slightly smaller than males. Upper parts brown; underparts paler; lower jaw and throat whitish; whitish extending to level of ear in some individuals; underfur gray, tipped with brown. Skull flattened dorsally; mastoid processes weak; tympanic bullae flattened, not in contact with paroccipital processes; palate projecting not more than 15 mm. behind upper molars.

Lutra canadensis brevipilosus Grinnell

1914. *Lutra canadensis brevipilosus* Grinnell, Univ. California Publ. Zool., 12:306, October 31, type from Grizzly Island, Suisun Bay, Solano Co., California.

MARGINAL RECORDS (Grinnell, *et al.*, 1937:275, 277–278, unless otherwise noted).—California: John's Camp, McCloud River; Feather River, "around" Lake Almanor. Nevada (Hall, 1946:199): Pyramid Lake; S end Marlette Lake. California: Babcock Lake, 9000 ft., Yosemite National Park; Kaweah River, 4 mi. NE Lemon Cove; Tulare Lake; San Joaquin River near Mendota; type locality; Price Creek, Humboldt Co.

Lutra canadensis canadensis (Schreber)

1776. *Mustela lutra canadensis* Schreber, Die Säugthiere . . . , Theil 3, Heft 18, pl. 126b. Type locality, Eastern Canada [= Quebec].

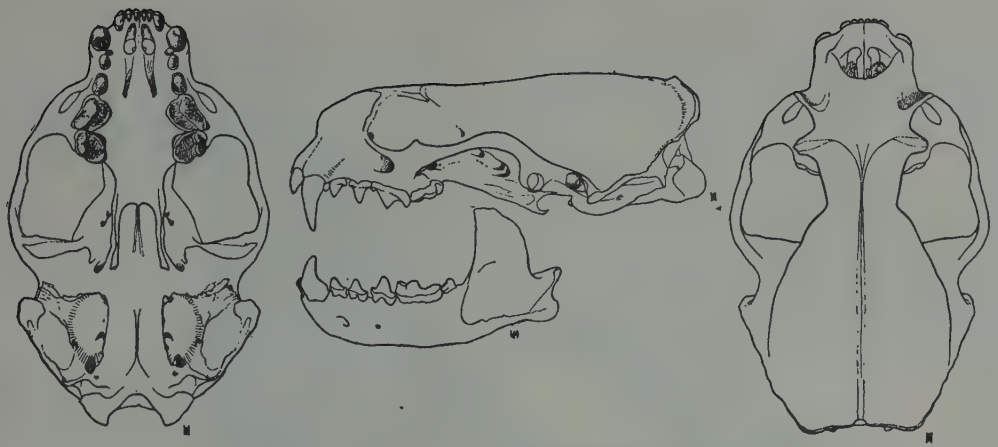


Fig. 502. *Lutra canadensis sonora*, 8 mi. up Colorado River from Needles, San Bernardino Co., California, No. 61451 M.V.Z., ♂, X ½.

1823. *Lutra canadensis*, Sabine, *in* Franklin, Narrative of a journey to the shores of the Polar Sea in . . . 1819–22, p. 653.
1847. *Lutra americana* Wyman, Proc. Boston Soc., 2:249, a *nomen nudum*.
1863. *Lutra destructor* Barnston, Canadian Nat. Geol., 8: 152, April, type from Michipicoten Island, Lake Superior, Ontario.

MARGINAL RECORDS.—Ontario: around Lake Nipigon (Dymond, 1928:241); Ghost River, Lake Abitibi region (Snyder, 1928:9). Quebec: Godbout (Preble, 1902:65). Nova Scotia: Cape Breton Island (Anderson, 1947:70), thence southward along coast to Massachusetts: Kingston (Pohle, 1920:86); Norwottuck Fish Hatchery, Amherst (Dearden, 1954:125, as *L. canadensis*). Virginia (Handley and Patton, 1947:133): Shenandoah County; Rockbridge County; Pulaski County. Alabama (A. H. Howell, 1921: 40): Ashford; Orange Beach; Bayou Labatre; Oakchia; Muscle Shoals. Iowa: Cambridge (Scott, 1937:61). South Dakota: *eastern side of state* (Over and Churchill, 1945:17). Wyoming: Willow Park, on Obsidian Creek (V. Bailey, 1930:142). Montana: Glacier National Park (V. Bailey, 1918:85).

Lutra canadensis chimo Anderson

1945. *Lutra canadensis chimo* Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, for 1944, p. 59, November 3, type from Chimo, Ungava Dist., Quebec, about 30 mi. S tip of Ungava Bay, Quebec.

MARGINAL RECORDS (Anderson, 1947:70).—Quebec: type locality. Labrador: Hamilton River. Quebec: Lake Mistassini; Little Whale River.

Lutra canadensis degener Bangs

1898. *Lutra degener* Bangs, Proc. Biol. Soc. Washington, 12:35, March 24, type from Bay St. George, Newfoundland. Known only from Newfoundland.
1920. *Lutra canadensis degener*, Pohle, Arch. Naturgesch., 85(Abt. A, No. 9):94, December.

Lutra canadensis evexa Goldman

1935. *Lutra canadensis evexa* Goldman, Proc. Biol. Soc. Washington, 48:182, November 15, type from Stuart Lake, near headwaters of Fraser River, British Columbia.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:331): Bear Lake; Indianpoint Lake; N fork of Eagle River; Kettle Valley; Chezacut.

Lutra canadensis extera Goldman

1935. *Lutra canadensis extera* Goldman, Proc. Biol. Soc. Washington, 48:181, November 15, type from Nagai Island, Shumagin Islands, Alaska. Known only from Nagai Island, Alaska.

Lutra canadensis interior Swenk

1920. *Lutra canadensis interior* Swenk, Univ. Nebraska Studies, 18:2, May 15, type from Lincoln Creek, W of Seward, Seward Co., Nebraska.

MARGINAL RECORDS.—Nebraska (Swenk, 1920:1–2): Holt County; Elkhorn River, near West Point. Tennessee: 4 mi. E Tiptonville (Goodpaster and Hoffmeister, 1952: 366); Open Lake (Kellogg, 1939:263). Mississippi: "*northwestern Mississippi*" (Yeager, 1938:195). Arkansas (Dellinger and Black, 1940:188): Desha County; near Monticello; Big Piney Creek; Spavinaw Creek, near Gravette. Oklahoma: Woodward County (2077 KU). Colorado: Boulder (Coues, 1877:312, as *L. canadensis*); Greeley (Warren, 1942:72, as *L. c. canadensis* or *sonora*); Julesberg (*ibid.*).

Lutra canadensis kodiacensis Goldman

1935. *Lutra canadensis kodiacensis* Goldman, Proc. Biol. Soc. Washington, 48:180, November 15, type from Uyak Bay, Kodiak Island, Alaska.

MARGINAL RECORDS (Goldman, 1935:181).—Alaska: Afognak Island; Lake Karluk, Kodiak Island.

Lutra canadensis lataxina F. Cuvier

1823. *Lutra lataxina* F. Cuvier, *in* Dictionnaire des sciences naturelle . . . , 27:242. Type locality, South Carolina.
1898. *Lutra canadensis lataxina*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:460, November 10.
1843. *Lataxina mollis* Gray, List of the . . . Mammalia in the . . . British Museum, p. 70. Based on *Lutra lataxina* F. Cuvier.
1897. *Lutra rhoadsi* Cope, Proc. Acad. Nat. Sci. Philadelphia, for 1896, p. 385, 391–392, type from Port Kennedy Bone Deposits, Pennsylvania.

MARGINAL RECORDS.—Connecticut: Liberty Hill (Hamilton, 1943:153), thence southward along coast to South Carolina: *northeastern coastal area* (Penney, 1950: 85); Anderson (*ibid.*). Virginia (Handley and Patton, 1947: 133): Patrick County; Nelson County; Loundoun County. Pennsylvania: Clinton County (Hamilton, 1943:153).

Lutra canadensis nexa Goldman

1935. *Lutra canadensis nexa* Goldman, Proc. Biol. Soc. Washington, 48:182, November 15, type from near Deeth, Humboldt River, Elko Co., Nevada.

MARGINAL RECORDS.—Idaho: Shoshone County (Rust, 1946:315); Birch Creek, Clark Co. (Davis, 1939: 140); Teton Basin (*ibid.*). Colorado (Cary, 1911:182–183, as *L. canadensis*): Snake River [near] Slater; Clear Creek County; White River Valley; Yampa Canyon Bear [= Yampa] River. Utah (Durrant, 1952:436, unless otherwise noted): Provo River, near Heber; Raft River, 2 mi. S Utah-Idaho border (Durrant, *et al.*, 1955:78); *¾ mi. E Utah-Nevada border, 4900 ft.* Nevada (Hall, 1946:198): type locality; 1 mi. E Golconda; Bull Head Ranch, near Paradise Valley. Oregon: Rome, Owyhee River (Goldman, 1935: 184).

Lutra canadensis optiva Goldman

1935. *Lutra canadensis optiva* Goldman, Proc. Biol. Soc. Washington, 48:179, November 15, type from Zaikof Bay, Montague Island, Alaska.

MARGINAL RECORDS (Goldman, 1935:180).—Alaska: Hinchinbrook Island; Cape Elizabeth, Kenai Peninsula.

Lutra canadensis pacifica Rhoads

1898. *Lutra hudsonica pacifica* Rhoads, Trans. Amer. Philos. Soc., n. s., 19:429, September, type from Lake Keechelus, 3000 ft., Kittitas Co., Washington.
1898. *Lutra canadensis pacifica*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:460, November 10.

MARGINAL RECORDS.—Alaska: *"southeastern Alaska"* (Anderson, 1947:70). British Columbia: Stuie (*ibid.*); Stave Lake (Cowan and Guiguet, 1956:331). Washington: Colville (Dalquest, 1948:210); Fort Spokane (Taylor and Shaw, 1929:12); Touchet (Dalquest, 1948:210). Oregon (V. Bailey, 1936, determined from map, p. 301): Robinette; Watson; Harney Lake; Klamath Falls; Rogue River, thence northward along coast to British Columbia (Cowan and Guiguet, 1956:331): Lulu Island; Eden Island; Bella Bella.

Lutra canadensis periclyzomae Elliot

1905. *Lutra periclyzomae* Elliot, Proc. Biol. Soc. Washington, 18:80, February 21, type from Gawi, west coast of Moresby Island, Queen Charlotte Islands, British Columbia.
1909. *Lutra canadensis periclyzomae*, Heller, Univ. California Publ. Zool., 5:262, February 18.

MARGINAL RECORDS.—Alaska: Anklin River, Yakutat Bay (Fisher, 1933:362); Windfall Harbor, Admiralty Island (Heller, 1909:262); Savok Bay, Baranof Island (*ibid.*). British Columbia: type locality.

Lutra canadensis preblei Goldman

1935. *Lutra canadensis preblei* Goldman, Proc. Biol. Soc. Washington, 48:178, November 15, type from near McTavish Bay, Great Bear Lake (on canoe route from Lake Hardisty), Mackenzie.

MARGINAL RECORDS.—Mackenzie: Mackenzie [River] Delta (Porsild, 1945:11); Lower Anderson River (Pohle, 1920:87, as *L. c. canadensis*); type locality; Lockhart River (*ibid.*). Manitoba: York Factory (*op. cit.*, p. 86, as *L. c. canadensis*); Oxford House (Goldman, 1935:179); Norway House (*ibid.*). Alberta (Soper, 1947:149): headwaters McLeod River, SW of Mountain Park; Wildhay River, a few miles downstream from Moberly Creek. Mackenzie: Fort Liard (Goldman, 1935:179).

Lutra canadensis sonora Rhoads

1898. *Lutra hudsonica sonora* Rhoads, Trans. Amer. Philos. Soc., n. s., 19:431, September, type from Montezuma Well, Beaver Creek, Yavapai Co., Arizona.
1898. *Lutra canadensis sonora*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:460, November 10.

MARGINAL RECORDS.—Colorado (Warren, 1942:72, as *L. c. canadensis* or *sonora*): Grand Junction; Gunnison River, below Delta. New Mexico (V. Bailey, 1932:323–324): Rinconada; Canadian River near mouth Mora River; Gila River, near Arizona line. California: 8 mi. N Needles (Grinnell, *et al.*, 1937:277). Nevada: Colorado River at junction with Virgin River (Hall, 1946:199). Utah: Colorado River at Glen Canyon (Durrant, 1952:436).

Lutra canadensis texensis Goldman

1935. *Lutra canadensis texensis* Goldman, Proc. Biol. Soc. Washington, 48:184, November 15, type from 20 mi. W Angleton, Brazoria Co., Texas.

MARGINAL RECORDS.—Texas (V. Bailey, 1905:196): Mobeetie; Texarkana. Louisiana (Goldman, 1935:185): Tallulah; Morgan City. Texas: Bay City (*ibid.*); region of Austin (V. Bailey, 1905:196).

Lutra canadensis yukonensis Goldman

1935. *Lutra canadensis yukonensis* Goldman, Proc. Biol. Soc. Washington, 48:180, November 15, type from Unalakleet, Norton Sound, Alaska.

MARGINAL RECORDS.—Alaska: Kanayut Lake, about 15 mi. NE Tolugak Lake (Rausch, 1950:466, as *L. canadensis*). Yukon: Macmillan River (Rand, 1945b:31); Ogilvie Mts. (*ibid.*). British Columbia: Teslin Lake, near Yukon (Anderson, 1947:71). Alaska: Wonder Lake area, Mt. McKinley National Park (Dixon, 1938:156, as *L. c. canadensis*); Frosty Peak, Alaska Peninsula (Goldman, 1935:180); type locality.

Map 477. *Lutra.*

1. *L. canadensis brevipilosus*
2. *L. canadensis canadensis*
3. *L. canadensis chimo*
4. *L. canadensis degener*
5. *L. canadensis evexa*
6. *L. canadensis extera*
7. *L. canadensis interior*
8. *L. canadensis kodiacensis*
9. *L. canadensis lataxina*
10. *L. canadensis nexa*
11. *L. canadensis optiva*
12. *L. canadensis pacifica*
13. *L. canadensis periclyzomae*
14. *L. canadensis preblei*
15. *L. canadensis sonora*
16. *L. canadensis texensis*
17. *L. canadensis yukonensis*
18. *L. canadensis vaga*
19. *L. canadensis vancouverensis*
20. *L. mira*
21. *L. annectens annectens*
22. *L. annectens latidens*
23. *L. annectens mesopetes*
24. *L. annectens repanda*

Lutra canadensis vaga Bangs

1898. *Lutra hudsonica vaga* Bangs, Proc. Boston Soc. Nat. Hist., 28:224, March, type from Micco, Brevard Co., Florida.
1898. *Lutra canadensis vaga*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 10:460, November 10.

MARGINAL RECORDS.—Georgia: Hursman's Lake (Pohle, 1920:91), thence southward throughout peninsular Florida: Grayton Beach (Sherman, 1937:111).

Lutra canadensis vancouverensis Goldman

1935. *Lutra vancouverensis* Goldman, Proc. Biol. Soc. Washington, 48:186, November 15, type from Quatsino, Vancouver Island, British Columbia. (Considered to be a synonym of *L. c. pacifica* by Cowan and Guiguet, Handbook No. 11, British Columbia Provincial Museum, p. 331, July 15, 1956.)
1948. *Lutra canadensis vancouverensis*, Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 2:210, April 9.

MARGINAL RECORDS.—British Columbia: type locality. Washington: Black Rock, San Juan Co. (Dalquest, 1948: 210).

Lutra mira Goldman
Prince of Wales Island Otter

1935. *Lutra mira* Goldman, Proc. Biol. Soc. Washington, 48:185, November 15, type from Kasaan Bay, Prince of Wales Island, Alaska.

Measurements of the skull of the type, a young adult ♂, and a young adult ♀ topotype are, respectively: condylobasal length, 127.7, 114.9; zygomatic breadth, 84.8, 71.2; alveolar length of maxillary tooth-row, 38.8, 37.9. Upper parts vandyke brown; underparts near verona brown; underside of neck and cheeks thinly overlaid with grayish, becoming more distinctly gray on upper lip. Skull large; braincase broad, relatively low and flat; auditory bullae flat. Skull similar in shape to that of *L. c. preblei* and *L. c. optiva*, but larger; from *L. c. periclyzomae*, *L. mira* differs in: skull larger; nasals less depressed, shorter, less extended posteriorly beyond maxillae; incisive foramina narrower, less broadly oval; palate with small, pointed, posterior, median projection; outer side of upper carnassial less deeply emarginate (after Goldman, 1935:185).

When sufficient material for study is available, *L. mira* will probably prove to be only subspecifically distinct from the neighboring races of *L. canadensis*.

MARGINAL RECORDS.—Alaska (Goldman, 1935:185): Shrubby Island; type locality.

Lutra annectens
Southern River Otter

External measurements: 940–1240; 390–500. One specimen from Durango weighed 14.75 kg. (32½ lb.) (Pohle, 1920:95). Skull: basal length, 101.0–113.0; zygomatic breadth, 72.0–85.0. Upper parts sepia brown to pale reddish brown; underparts gray brown; throat, inguinal, and pectoral regions paler; lips and inner side of forelegs dirty-white. Skull slightly convex dorsally; mastoid processes strong; rhinarium straight dorsally or with acute projection from upper side; furred near upper border of nostrils; anterior part of intermaxillary without sharp bend.

Lutra annectens annectens Major

1897. *Lutra annectens* Major, Zool. Anzeiger, 20:142, April 26, type from Río de Tepic, Nayarit.

MARGINAL RECORDS.—Durango: Melchor, Río Nazas (Pohle, 1920:95). Veracruz: Orizaba (*ibid.*); Río Blanco, 15 km. W Piedras Negras, 500 ft. (19271 KU). Guatemala: Verapaz (Pohle, 1920:95); Santana Mixtan (*ibid.*), thence northward along Pacific Coast to Nayarit: Río de Tepic, 100 mi. S Escuinapa (J. A. Allen, 1906:235).

Lutra annectens latidens J. A. Allen

1908. *Lutra latidens* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 24:600, October 13, type from Lavala [= Savala], Matagalpa, Nicaragua.
1920. *Lutra annectens latidens*, Pohle, Arch. Naturgesch., 85(Abt. A, No. 9):95, December.

MARGINAL RECORDS.—Yucatán: a small river, 40 mi. W Mérida (Hershkovitz, 1951:561), thence along Caribbean Coast to Nicaragua: Río Tuma (Pohle, 1920:96); Peña Blanca (*ibid.*).

Lutra annectens mesopetes (Cabrera)

1924. *Lontra mesopetes* Cabrera, Bol. Real Soc. Española Hist. Nat., Madrid, 24:52, February, type from Costa Rica. Known only from the type locality.
1955. *Lutra annectens mesopotes* [*sic*], Miller and Kellogg, Bull. U.S. Nat. Mus., 205:766, March 3.

Lutra annectens repanda Goldman

1914. *Lutra repanda* Goldman, Smiths. Miscl. Coll., 63(5): 3, March 14, type from Cana (Santa Cruz de Cana), 2000 ft., upper Río Tuyra, Darién, Panamá.
1920. *Lutra annectens repanda*, Pohle, Arch. Naturgesch., 85(Abt. A, No. 9):96, December.

MARGINAL RECORDS.—Costa Rica: Villa Colon (Goodwin, 1946:433). Panamá: type locality.

Genus Enhydra Fleming—Sea Otter

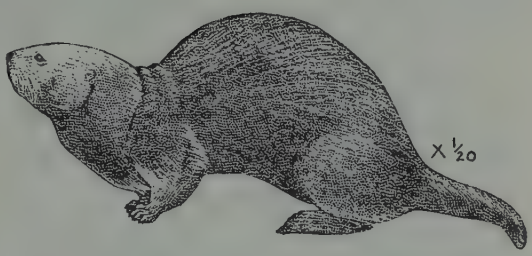
1822. *Enhydra* Fleming, The philosophy of zoology; . . . , 2:187. Type, *Mustela lutris* Linnaeus.

1816. *Pusa* Oken, Lehrbuch der Naturgeschichte, 3, 2:985. Type, *Pusa orientalis* Oken. Not of Scopoli, 1771. Oken's names not available.

1827. *Latax* Gloger, Nov. Acta Phys.-Med. Acad. Caes. Leop.-Carol., 13(2):511. Type, *Mustela lutris* Linnaeus. Under the mistaken impression that *Enhydra* Fleming was preoccupied by *Enhydris* Merrem, 1820, a reptile, *Latax* has been used for the sea otters. *Enhydra* is not a homonym of *Enhydris* (see Article 36 of the International Code of Zoological Nomenclature, and Opinion 25 of the International Commission of Zoological Nomenclature).

1829. *Enydris* Fischer, Synopsis mammalium, p. 228, an emendation of *Enhydra* Fleming.

Enhydra lutris
Sea Otter



Head large, blunt; neck short, thick; ears short, pointed; legs and tail short; hind feet webbed, flattened into broad flippers, furred dorsally and ventrally, 5th digit longest; forefeet small, palms naked. Color varying from black to almost red, usually uniform dark brown, paler on throat and chest. Upper parts, underparts and head grizzled in some. Skull: high, inflated, flattened dorsally; facial region broad and flat; orbits relatively large; postorbital processes small; auditory bullae small; palate extending posterior to plane of M1 only a short distance. P4 and M1 wider than long; M1 and p4 oval; cusps broad, rounded. Dentition, i. $\frac{3}{2}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{1}{2}$

External measurements of an adult ♂ and ♀, respectively, are: 1478, 360, 220; 1289, 273, 222. Weight of a male and a female, respectively, 34.4, 19.7 kg. Condylobasal length, ♂ 141–146, ♀ 131–133; zygomatic breadth, ♂ 103–106, ♀ 97–103. For additional characters see description of the genus. *Enhydra* is monotypic.

Sea otters formerly were present in large numbers in the kelp beds along the Pacific Coast of North America. Their thick, glossy fur almost led to their extermination by 1910. Sea otters feed on sea urchins, mollusks, crabs, and fish. Breeding and birth of young are believed to occur throughout the

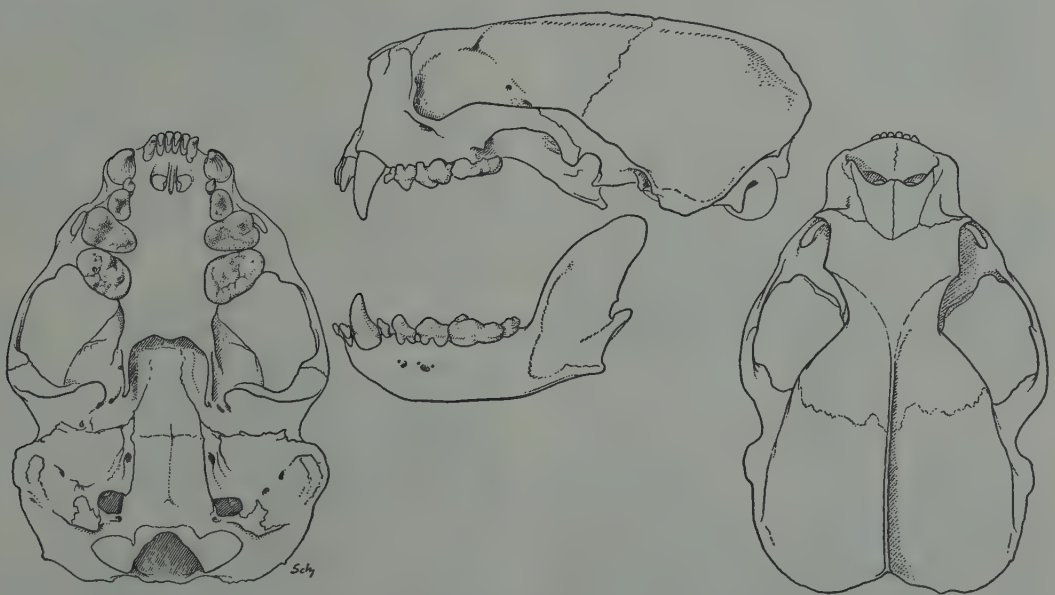


Fig. 503. *Enhydra lutris nereis*, shore ¼ mi. N Bixby Creek, Monterey Co., California, No. 84812 M.V.Z., ♂, X ½.

year, although Scheffer (1951:11) suggests that the young are born in April and May. Only a single offspring is born at a time, and the gestation period is believed to be eight or nine months. Not mapped.

Enhydra lutris lutris (Linnaeus)

1758. [*Mustela*] *lutris* Linnaeus, Syst. nat., ed. 10, 1:45. Type locality, Kamchatka, U.S.S.R.
1843. *Enhydra lutris*, Gray, List of the . . . Mammalia in the . . . British Museum, p. 72.
1777. [*Lutra*] *marina* Erxleben, Systema regni animalis . . . , p. 445. Type locality, unknown.
1800?. *Lutra gracilis* Bechstein, Thomas Pennant's allgemeine Uebersicht der vierfüssigen Thiere . . . , 2:408. Type locality, "Staatenland" [= southernmost of the Kurile Islands], see Hollister, Jour. Mamm., 2:177, August 19, 1921.
1816. *Pusa orientalis* Oken, Lehrbuch der Naturgeschichte, 3(2):986. Oken's names are not available.
1827. *Lutra stelleri* Lesson, Manuel de mammalogie, . . . , p. 156. Type locality, Kamchatka.
1922. *Enhydra lutris kamtschatica* Dybowski, Arch. Tow. Nauk. Lwow, 1:350, a *nomen nudum*.

RANGE.—Alaska: end of Aleutian Islands chain (Anderson, 1947:71), along islands and coast to British Columbia: Vancouver (*ibid.*).

Enhydra lutris nereis (Merriam)

1904. *Latax lutris nereis* Merriam, Proc. Biol. Soc. Washington, 17:159, October 6, type from San Miguel Island, Santa Barbara Islands, California.
1923. *Enhydra lutris nereis*, Grinnell, Univ. California Publ. Zool., 21:316, January 27.

RANGE.—Washington: Straits of Juan de Fuca (Taylor and Shaw, 1929:12), southward along coast to Baja California: Sebastián Vizcaíno Bay (Scammon, 1874:169).

FAMILY VIVERRIDAE—Viverrids

Dentition essentially as in the Mustelidae, but upper molars usually 2–2, and upper carnassial usually having 3 outer cusps; auditory bullae, when not rudimentary (1 African genus), inflated, thin walled, divided by a distinct septum into 2 chambers; form usually slender, legs short; size moderate; feet digitigrade (after Miller, 1912:440).

SUBFAMILY HERPESTINAE—Mongooses

Naked glandular pouch around anus and capable of being folded over anus; anal glands opening into mentioned pouch, outside anus proper; perineal perfume glands absent; claws long and non-retractile; ear lacking marginal bursa; penis short; external auditory meatus at end of a bony tube; orbit completely encircled with bone in most members of the subfamily (after Pocock, 1941:2).

Genus Herpestes Illiger
Mongooses

1811. *Herpertes* [*sic*] Illiger, Prodromus systematis mammalium et avium . . . , p. 135, a misprint, corrected to *Herpestes* on p. 302. Type, *Viverra ichneumon* Linnaeus.
1799. *Ichneumon* Lacépède, Tableau des divisions . . . des mammifères, des cétacés et des oiseaux, p. 7. Not *Ichneumon* Linnaeus, 1758, a genus of Hymenoptera.
1822. *Mangusta* Horsfield, Zoological researches in Java . . . , pt. 5, unpaged. Type, *Ichneumon javanicus* É. Geoffroy Saint-Hilaire.
1837. *Urva* Hodgson, Jour. Asiatic Soc. Bengal, 6:56. Type, *Gulo urva* Hodgson.
1841. *Mesobema* Hodgson, Jour. Asiatic Soc. Bengal, 10: 910. Type, *Gulo urva* Hodgson.
1865. *Calogale* Gray, Proc. Zool. Soc. London, p. 560, October. Type, *Herpestes nepalensis* Gray [= *Mangusta auropunctata* Hodgson].
1865. *Calictis* Gray, Proc. Zool. Soc. London, p. 564, October. Type, *Herpestes smithii* Gray.
1865. *Taeniogale* Gray, Proc. Zool. Soc. London, p. 569, October. Type, *Herpestes smithii* Gray.
1865. *Onychogale* Gray, Proc. Zool. Soc. London, p. 570, October. Type, *Cynictis maccarthiae* Gray.

Total length, 585–865; tail, 230–440; guard hairs banded, imparting characteristic speckled appearance to coat; premolars $\frac{4}{4}$.

Herpestes javanicus
Indian Mongoose

External measurements: (♂) 335; 270; 62; (♀) 5 to 10 per cent less; condylobasal length of skull, 57 (♀) to 66 (♂); zygomatic breadth, 30–34; legs short. Reddish gray or yellowish gray, vermiculated or speckled.

All classes of vertebrates and many kinds of invertebrates are eaten. Where introduced in the West Indies, to reduce numbers of the introduced rats of the genus *Rattus*, the mongoose has exterminated many species of native mammals. *Rattus* persists along with the mongoose that has made a pest of itself.

Herpestes javanicus auropunctatus (Hodgson)

1836. *Mangusta auropunctata* Hodgson, Jour. Asiatic Soc. Bengal, 5:235. Type locality, Nepal.
1937. *Herpestes javanicus auropunctatus*, Pocock, Jour. Bombay Nat. Hist. Soc., 29:241, April 15.

RANGE.—Natural range of the subspecies *H. j. auropunctatus* is northern India. Introduced and widely established in the West Indies. Not mapped.

FAMILY FELIDAE—Cats and Allies

Medium to large digitigrade carnivores; feet haired below, except for naked pads; plantar pad wide, indistinctly trilobate; claws short, curved and

retractile (except in *Acinonyx*); forefeet 5-toed; pollex small and set high above other toes; carpal pad single, small, and subconical; hind feet with 4 digits; metatarsal pads absent; baculum rudimentary.

Muzzle short, broad, not appreciably overlapping chin; ears with well-developed bursa, anterior flap of which is notched mesially; supratragus simple, with a clavate thickening; supercilliary and mystacial vibrissae well developed; interramal tuft of vibrissae absent.

Skull comparatively short and broad; muzzle wide; ethmoturbinals comparatively long, extending to anterior part of chamber and overlying reduced maxilloturbinals; auditory bulla high, rounded, and composed of ecto- and endo-tympanics which are divided by a partition; alisphenoid canal absent.

Upper and lower incisors forming straight, transverse line; canines pointed, grooved, somewhat compressed posteriorly; P2, when present, small, conical, single-rooted; P3 moderate-sized, crown triangular, compressed with 3 cusps set in a line; anterior cusp and posterior cusp small and set at base of large, pointed middle cusp; P4 large, crown compressed, with cusps set in a line, the first small and conical, the second high and pointed, the third low and bladelike; protocone well developed; M1 small, transversely set; p3 and p4 resembling P3; m1 with well-developed paraconid and protoconid; metaconid absent; talonid small. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{2}{2}$ or $\frac{3}{2}$, m. $\frac{1}{1}$.

KEY TO NORTH AMERICAN GENERA OF FELIDAE

1. Tail more than ⅓ length of body; premolars $\frac{3}{2}$. . . . . *Felis*, p. 951
1′. Tail less than ⅓ length of body; premolars $\frac{2}{2}$. . . . . *Lynx*, p. 966

Genus Felis Linnaeus—Cats

1758. *Felis* Linnaeus, Syst. nat., ed. 10, 1:41. Type, *Felis catus* Linnaeus.

1775. *Catus* Frisch, Das Natur-System der vierfüssigen Thiere . . . , Tab. 12. Type, *Felis catus* Linnaeus. Frisch's names, as well as Oken's, are not available.

1775. *Panthera* Frisch, Das Natur-System der vierfüssigen Thiere . . . , Tab. 13. Type, "Das Pantherthier." Frisch's names, as well as Oken's, are not available.

1775. *Tigris* Frisch, Das Natur-System der vierfüssigen Thiere . . . , Tab. 13. Type, *Felis tigris* Linnaeus. Frisch's names, as well as Oken's, are not available.

1829. *Leo* Brehm, Oken's Isis, p. 637.

1834. *Puma* Jardine, The naturalist's library, 2:266. Type, *Felis concolor* Linnaeus.

1841. *Otocolobus* Brandt, Bull. Acad. Sci. St. Pétersbourg, 9:38. Type, *Felis maul* Pallas.

1842. *Leopardus* Gray, Ann. Mag. Nat. Hist., ser. 1, 10:260, December. Type, *Leopardus griseus* Gray [= *Felis pardalis* Linnaeus].

1843. *Chaus* Gray, List of the . . . Mammalia in the . . . British Museum, p. 44. Type, *Felis chaus* Güldenstaedt.

1854. *Uncia* Gray, Ann. Mag. Nat. Hist., ser. 2, 14:394, November. Type, *Felis uncia* Schreber.

1858. *Catolynx* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:385, September. Type, *Felis catus* Linnaeus.

1858. *Herpailurus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:385, September. Type, *Felis yaguarundi* Azara.

1858. *Jaguarius* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:386, September. Type, *Felis onca* Linnaeus.

1858. *Oncoides* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:386, September. Type, *Felis pardalis* Linnaeus.

1858. *Dendrailurus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:386, September. Type, *Felis strigilata* Wagner.

1858. *Oncifelis* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:386, September. Type, *Felis geoffroyi* Gervais.

1858. *Profelis* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:386, September. Type, *Felis celidogaster* Temminck [= *Felis aurata* Temminck].

1858. *Noctifelis* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:386, September. Type, *Felis guigna* Molina.

1858. *Lynchailurus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:386, September. Type, *Felis pajeros* Desmarest.

1858. *Prionailurus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:387, September. Type, *Felis pardachrous* [*sic*] Hodgson [= *Felis bengalensis* Kerr].

1858. *Zibethailurus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:387, September. Type, *Felis viverrina* Bennett.

1858. *Catopuma* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:387, September. Type, *Felis moormensis* Hodgson [= *Felis temminckii* Vigors and Horsfield].

1858. *Pardofelis* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:387, September. Type, *Felis marmorata* Marin.

1858. *Ictailurus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:387–388, September. Type, *Felis planiceps* Vigors and Horsfield.

1858. *Leptailurus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:389, September. Type, *Felis serval* Schreber.

1858. *Otailurus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:388, September. Type, *Felis megalotis* Müller.

1858. *Chrysailurus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:389, September. Type, *Felis negelecta* Gray [= *Felis celidogaster* Temminck].

1864. *Serval* Brehm, Fuhrer Z. Garten Hamburg, ed. 6, p. 52. Type, *Serval maculatus* Brehm.

1866. *Galeopardus* Heuglin and Fitzinger, Sitzungsber. k. Akad. Wiss., Wien, 54:557. Type, *Felis serval* Schreber.

1867. *Neofelis* Gray, Proc. Zool. Soc. London, p. 265, October. Type, *Felis macrocelis* Temminck.

1867. *Pardalina* Gray, Proc. Zool. Soc. London, p. 266, October. Type, *Felis himalayanus* Warwick [= *Felis geoffroyi* Gervais?].

1867. *Catolynx* Gray, Proc. Zool. Soc. London, p. 267, October. Type, *Felis marmorata* Martin. Not *Catolynx* Severtzow, 1858.

1867. *Viverriceps* Gray, Proc. Zool. Soc. London, p. 268, October. Type, *Felis viverrina* Bennett.

1867. *Pajeros* Gray, Proc. Zool. Soc. London, p. 269, October. Type, *Felis pajeros* Desmarest.

1868. *Pardus* Fitzinger, Sitzungsber. k. Akad. Wiss., Wien, 58:459. Type, *Felis pardus* Linnaeus.

1869. *Margay* Gray, Catalogue of the carnivorous, pachydermatous and edentate Mammalia in the British Museum, p. 21. Type, *Felis wiedii* Schinz.

1869. *Ailurogale* Fitzinger, Sitzungsber. k. Akad. Wiss., Wien, 60:249. Type, *Felis planiceps* Vigors and Horsfield.
1870. *Ailurinus* Gervais, Nouv. Arch. Mus. Paris, 6:159. Type, "l'Ailurin" Gervais, 1855, Histoire naturelle des mammifères . . . , 2:87 [= *Felis planiceps* Vigors and Horsfield].
1874. *Pyrofelis* Gray, Ann. Mag. Nat. Hist., ser. 4, 14:354, November. Type, *Felis temminckii* Vigors and Horsfield.
1882. *Plethaelurus* Cope, Proc. American Philos. Soc., 20: 475, November 20. Type, *Felis planiceps* Vigors and Horsfield.
1894. *Servalina* Grevé, Nova Acta Acad. Caes. Leop.-Carol., 63:76. Type, *Felis serval* Schreber.
1905. *Trichaelurus* Satunin, Ann. Mus. Zool. St. Pétersbourg, 9:495, a renaming of *Otocolobus* Brandt, which was thought to be preoccupied.
1919. *Oncilla* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 41: 355. Type, *Felis pardinoides oncilla* Thomas.
1925. *Poliailurus* Lönnberg, Arkiv. Zool. Stockholm, 2(18A): 2. Type, *Felis pallida* Buechner [= *Felis bieti* Milne-Edwards].
1926. *Microfelis* Roberts, Ann. Transvaal Mus., 11:250. Type, *Felis nigripes* Burchell.
1926. *Eremaelurus* Ognev, Ann. Mus. Zool. Leningrad, 27: 356. Type, *Eremaelurus thinobius* Ognev [= a subspecies of *Felis margarita* Loche].
1932. *Badiofelis* Pocock, Proc. Zool. Soc. London, p. 749. Type, *Felis badia* Gray.
1933. *Mungofelis* Antonius, Zool. Gart., Leipzig, 6:13. Type, *Felis braccata* Cope.

Medium to large digitigrade carnivores; tail usually long; feet large; forefeet with 5 toes, hind feet with 4 toes; claws sharp, recurved, and retractile; eyes large; ears well developed, medium in size; coat tawny, spotted, or striped. Skull highly arched in frontal region; face flattened; rostrum short; carotid canal short or lacking; alisphenoid canal absent; tympanic bullae large, divided internally into two chambers; palate ending posterior to molars; clavicles small, floating; os penis rudimentary. M1 rudimentary; m1 lacking talonid and metaconid. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{3}{2}$, m. $\frac{1}{1}$

KEY TO NORTH AMERICAN SPECIES OF FELIS

1. Total length more than 1400; greatest length of skull more than 158.
   2. Upper parts not spotted; bregmatic processes of parietals extending anteromedially over frontals, approaching or reaching temporal crest and fusing with frontals in old animals. . *F. concolor*, p. 955
   2′. Upper parts spotted; bregmatic processes of parietals not extended as described in 2 above. . . . . *F. onca*, p. 952
1′. Total length less than 1400; greatest length of skull less than 158.
   3. Upper parts not spotted; skull only slightly arched; nasals extending anteriorly beyond plane of anterior edge of palatine foramina; palatine foramina not visible in dorsal aspect. *F. yagouaroundi*, p. 964
   3′. Upper parts spotted; skull highly arched; nasals not extending anteriorly to plane of anterior edge of palatine foramina; palatine foramina visible in dorsal aspect.
      4. Hind foot more than 145; greatest length of skull more than 120; basilar length more than 90; length of P4 more than 12.7. . . . . *F. pardalis*, p. 959
      4′. Hind foot less than 145; greatest length of skull less than 120; basilar length less than 90; length of P4 less than 12.7.
         5. Hair on nape directed forwards; mastoid breadth half or more (50.7–53.0 per cent) of basilar length. *F. wiedii*, p. 961
         5′. Hair on nape directed backwards; mastoid breadth less (44.2–48.7 per cent) than half of basilar length. *F. tigrina*, p. 964

Felis onca
Jaguar

Revised by Nelson and Goldman, Jour. Mamm., 14:221–240, August 17, 1933.

External measurements: (6 ♂) 1727–2419; 523–665; 229–302 (3 ♂); (5 ♀) 1574–2190; 432–604; 225 (1 ♀). Weight of one male from Brazil: 131.8 kg. Greatest length of skull, (♂) 237.5–302.0, (♀) 204.0–267.8; zygomatic breadth, (♂) 166.5–207.0, (♀) 143.8–175.5; crown length of upper carnassial, (♂) 23.5–29.2, (♀) 24.1–30.8. Size large; form robust; tail relatively short and tapering; ears small, short, and rounded, without elongated terminal tufts; pelage short and rather bristly; upper parts profusely spotted at all ages.

Ground color of upper parts varying from light ochraceous buff or pale straw color to light golden tawny or tan, nearly uniform over median dorsal

area from top of head to base of tail, becoming gradually paler to near cinnamon buff or light buff on cheeks, side of neck, lower parts of flanks and outer surfaces of legs; body heavily spotted with black; dorsum, except posterior median line and sides, marked with irregularly circular or crescentic or broken spots that tend to form rosettes or to enclose smaller spots in a field darker than the general ground color; posterior part of median line bearing elongated solid black spots that tend to present an irregular laterally paired arrangement or to become confluent; top and sides of head, neck,

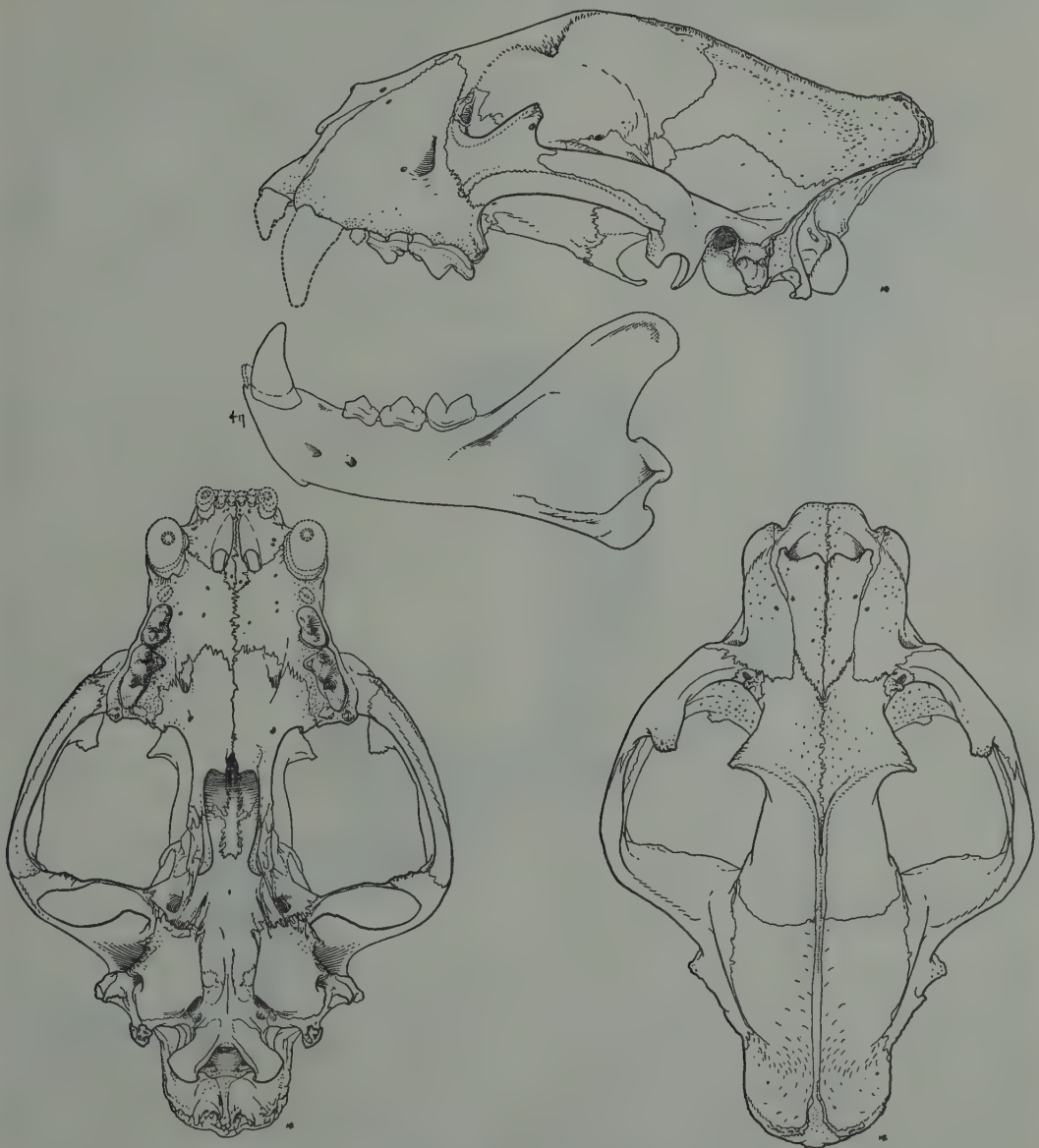
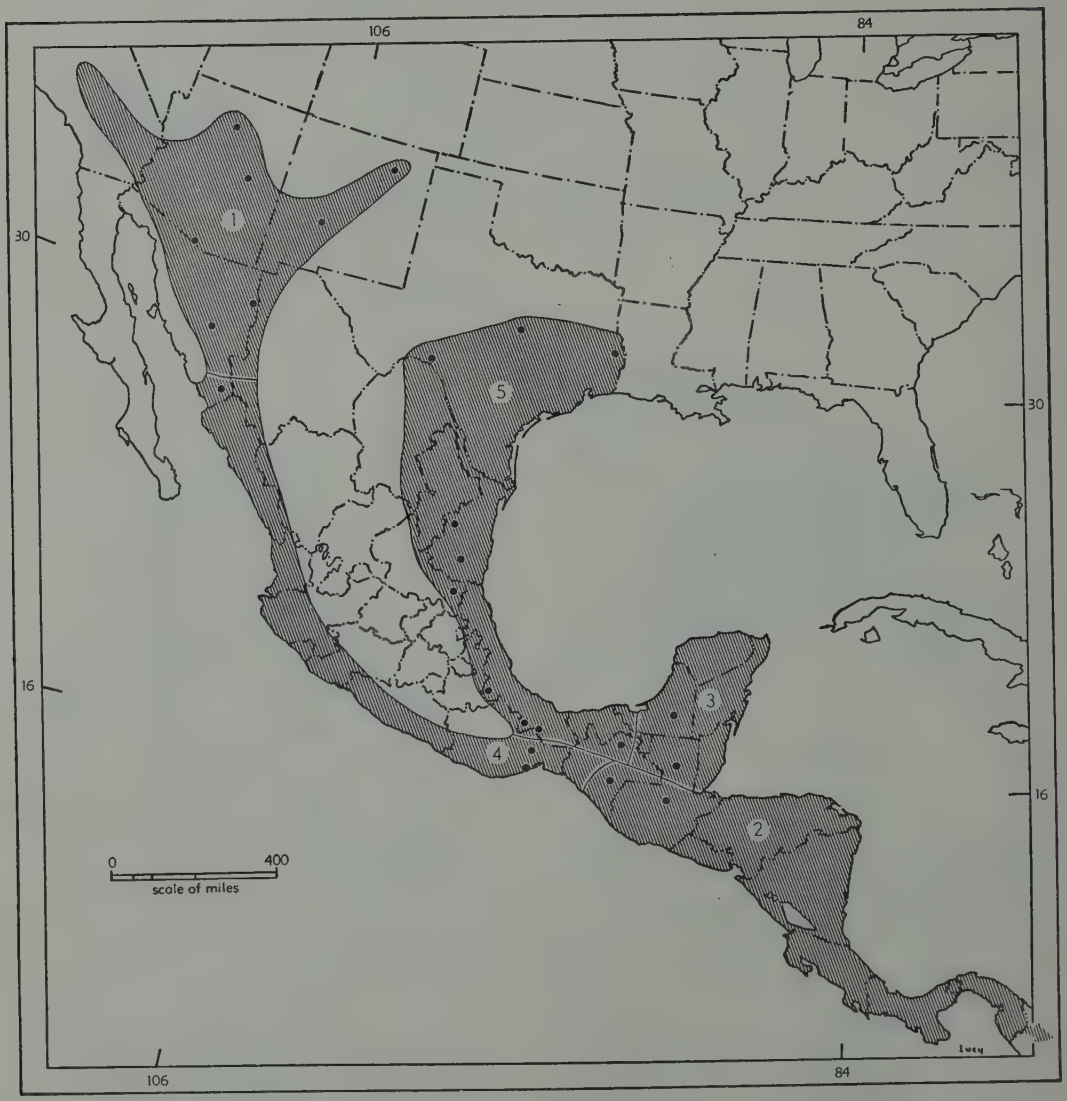


Fig. 504. *Felis onca hernandesii*. 10 mi. N Colotopec, Oaxaca, No. 35317 M.V.Z., sex ?, X ¾.

and feet marked by smaller black spots; underside of neck and inner sides of forelegs marked with more or less confluent black spots that tend to form transverse bars; upper surface of muzzle varying from pinkish buff to clay color, unspotted; cheeks, forehead, and feet with small, rounded black spots; upper and lower lips white near middle, becoming black toward angles of mouth; outer sides of ears deep black, with small buffy median spots; inner sides of ears thinly clothed with whitish hairs; tail with crowded, irregular black markings, separated on basal half above by narrow pinkish buffy or cinnamon buffy interspaces, becoming white below and toward tip, which is



Map 478. *Felis onca.*

1. *F. o. arizonensis* 2. *F. o. centralis* 3. *F. o. goldmani* 4. *F. o. hernandesii* 5. *F. o. veraecrucis*

usually black (after Nelson and Goldman, 1933: 223–224).

The largest of the American spotted cats, the jaguar feeds on peccaries, tapirs, agoutis, turtles, and fish. In the northern part of its range, the jaguar breeds in January, and the young (2–4) are born after a gestation period of 99–105 days.

Felis onca arizonensis Goldman

1932. *Felis onca arizonensis* Goldman, Proc. Biol. Soc. Washington, 45:144, September 9, type from near Cibecue, Navajo Co., Arizona.

MARGINAL RECORDS.—New Mexico: near Springer (Hill, 1942:78, as *F. o. hernandesii*; assigned here to *arizonensis* on geographic grounds); Goldberg Ranch, Jornada Experiment Range, Caballo Mts. (Halloran, 1946:160). Sonora (Burt, 1938:33): western foothills of Sierra Madre, due W Casas Grandes, Chihuahua; 15 mi. W Alamo Ranch. Arizona: 20 mi. W Nogales (Nelson and Goldman, 1933: 238). California: *Tehachapi Mts.* (Merriam, 1919:39). Arizona: 4 mi. S. Grand Canyon rim (V. Bailey, 1935:30); type locality.

Felis onca centralis Mearns

1901. *Felis centralis* Mearns, Proc. Biol. Soc. Washington, 14:139, August 9, type from Talamanca, Limón, Costa Rica (probably near Sipurio, in valley of Río Sicsola).
1904. [*Felis*] *onca centralis*, Elliot, Field Columb. Mus., Publ. 95, Zool. Ser., 4:446.

MARGINAL RECORDS.—Chiapas: near Comitán (Booth, 1957:17), thence southeastward throughout Central America.

Felis onca goldmani Mearns

1901. *Felis hernandesii goldmani* Mearns, Proc. Biol. Soc. Washington, 14:142, August 9, type from Yohaltun, Campeche.
1932. *Felis onca goldmani*, Goldman, Proc. Biol. Soc. Washington, 45:144, September 9.

MARGINAL RECORDS (Nelson and Goldman, 1933: 235).—Campeche: La Tuxpeña, thence around coast to *British Honduras*. Guatemala: La Libertad.

Felis onca hernandesii (Gray)

1858. *Leopardus hernandesii* Gray, Proc. Zool. Soc. London, for 1857, p. 278, January 28, type from Mazatlán, Sinaloa.
1932. *Felis onca hernandesii*, Goldman, Proc. Biol. Soc. Washington, 45:144, September 9.

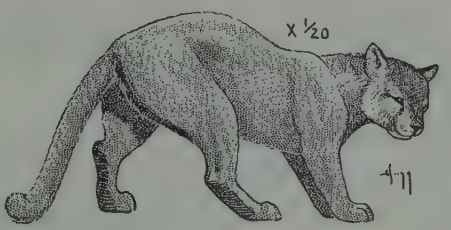
MARGINAL RECORDS (Nelson and Goldman, 1933: 236, unless otherwise noted).—Sonora: mountains near Alamos (Burt, 1938:33), thence southward along W slope of Sierra Madre Occidental to Oaxaca: Chivela; Tehuantepec; thence northward along coast to point of beginning.

Felis onca veraecrucis Nelson and Goldman

1933. *Felis onca veraecrucis* Nelson and Goldman, Jour. Mamm., 14:236, August 17, type from San Andrés Tuxtla, Veracruz.

MARGINAL RECORDS (Nelson and Goldman, 1933: 237, unless otherwise noted).—Texas: Goldthwaite; S Jasper (Taylor, 1947:66, as *F. onca*), thence southward along Gulf Coast to Chiapas: Palenque. Veracruz: Achotal (Elliot, 1907:38); Pérez; Orizaba. San Luis Potosí: Cueva de las Sabinas, 12 km. NE Ciudad Valles (17904 KU). Tamaulipas: 5 km. N Gómez Farías (Goodwin, 1954:15); Sierra de Tamaulipas, 10 mi. W, 2 mi. S Piedra (57004 KU). Texas: near mouth of Pecos River, Val Verde Co. (Taylor, 1947:66, as *F. onca*).

Felis concolor
Mountain Lion



Revised by Goldman, *Classification of the races of the puma*, pt. 2, pp. 177–302, pls. 43–93, 1 fig. in text, *in* Young and Goldman, *The puma*, mysterious American cat, pp. xiv + 358, 93 pls., 6 figs. in text, Amer. Wildlife Inst., Washington, D. C., November 16, 1946.

External measurements: (♂) 1710–2743; 660–784; 240–292; (♀) 1500–2332; 534–815; 220–267. Weight: (♂) 67–103 kg.; (♀) 36–60 kg. Greatest length of skull, (♂) 172.0–237.0, (♀) 158.3–203.0; zygomatic breadth, (♂) 126.4–164.3, (♀) 107.2–140.7; alveolar length of maxillary tooth-row, (♂) 52.5–72.0, (♀) 48.8–62.5. Form slender; ears small, rounded. Upper parts grizzled gray or dark brown to shades of buff, cinnamon, tawny, cinnamon-rufous, or ferruginous; color usually most intense along middorsal line from top of head to base of tail; shoulders and flanks lighter; underparts dull whitish, overlaid with buff across abdomen; sides of muzzle black; chin and throat white; ears black externally with grayish median patches on some; tail above like back, lighter below, distal 2 to 3 inches black. Young are spotted with black on a buffy ground color.

Skull short, broad; sagittal crest convex in outline; lambdoidal crest having a deep lateral concavity; spiculelike bregmatic processes of parietal extending anteromedially over frontals, approaching or reaching temporal ridge and fusing with frontals in old specimens; nasals expanded distally; palate wide; grooves on canines obsolescent or absent.

The puma has the largest range of any species of native mammal in the Western Hemisphere, occurring from British Columbia to Patagonia.

At present, in western North America, it occurs primarily in regions poorly populated by humans. The favored food of the puma is deer. The puma has been extirpated in many parts of its range. Pumas probably breed at three years of age; the young are born after a gestation period of 90–96 days. The usual number of young is 2 (1–6), and dates of birth for 5 litters in North America are February, April, June, and July.

Felis concolor azteca Merriam

1901. *Felis hippolestes aztecus* Merriam, Proc. Washington Acad. Sci., 3:592, December 11, type from Colonia García, 6700 ft., about 60 mi. SW Casas Grandes, Chihuahua.
1929. *Felis concolor azteca*, Nelson and Goldman, Jour. Mamm., 10:347, November 11.

MARGINAL RECORDS (Goldman, 1946:231–232, unless otherwise noted).—New Mexico: 10 mi. W Tusas; Queen. Chihuahua: Gallego. Zacatecas: Chichimaquillas, 20 mi. E Fresnillo. San Luis Potosí (Dalquest, 1953b:198): Platanito; Xilitla. Morelos: north of Yautepec (Davis and Russell, 1954:71). Jalisco: Los Masos, thence northward along coast to Arizona: Baboquivari Mts.; Wagoner; Burro Creek, Mohave Co.; Flagstaff. New Mexico: Bluewater; head Santa Clara Creek, Jemez Mts.

Felis concolor browni Merriam

1903. *Felis aztecus browni* Merriam, Proc. Biol. Soc. Washington, 16:73, May 29, type from Lower Colorado River, 12 mi. S Yuma, Yuma Co., Arizona.
1929. *Felis concolor browni*, Nelson and Goldman, Jour. Mamm., 10:347, November 11.

MARGINAL RECORDS (Goldman, 1946:227, unless otherwise noted).—Arizona: Hualpai Mts.; vicinity Squaw Creek, Kofa Mts., 50 mi. NE Yuma (Young, 1946:15); type locality. Baja California: 6 mi. NW Cataviña; 18 mi. S Tres Pozos. California: Colorado River, 20 mi. N Picacho.

Felis concolor californica May

1896. *Felis californica* May, California game "marked down," p. 22. Type locality, Kern County, California.
1929. *Felis concolor californicus*, Nelson and Goldman, Jour. Mamm., 10:347, November 11.

MARGINAL RECORDS (Goldman, 1946:220–223, unless otherwise noted).—Oregon: 63 mi. NE Grants Pass; Rock Creek, Jackson Co. California: Genesee. Nevada (Hall, 1946:274): Spooner; vicinity of Wichman; Silver Peak Range. California: Marble Fork Bridge, Sequoia National Park; head Brush Creek, E side Kern River, 25 mi. above Kernville; San Bernardino Mts.; Strawberry Creek, San Jacinto Mts.; Buckman Springs. Baja California: Rancho San Antonio, San Pedro Mártir Mts.; vicinity of San Quentín, thence northward along coast to Oregon: 15 mi. W Waldo; 35 mi. W Selma.

Felis concolor coryi Bangs

1896. *Felis concolor floridana* Cory, Hunting and fishing in Florida . . . , p. 109, type from wilderness back of Sebastian, Brevard Co., Florida. Not *F. floridana* Desmarest, 1820.
1899. *Felis coryi* Bangs, Proc. Biol. Soc. Washington, 13:15, January 31, a renaming of *F. c. floridana* Cory.
1929. *Felis concolor coryi*, Nelson and Goldman, Jour. Mamm., 10:347, November 11.
1911. *Felis arundivaga* Hollister, Proc. Biol. Soc. Washington, 24:176, June 16, type from 12 mi. SW Vidalia, Concordia Parish, Louisiana.

MARGINAL RECORDS.—Arkansas: Greene County (Young, 1946:14, as *F. concolor*). Mississippi: Tunica County (Young, 1946:26, as *F. concolor*). Alabama: DeKalb County (Young, 1946:12, as *F. concolor*). Georgia (Young, 1946:19, as *F. concolor*): Bartow County; NW of Dahlonega; Glynn County, thence along Atlantic and Gulf coasts to Louisiana: highway between Robeline and Spanish Lake (Young, 1946:23, as *F. concolor*). Arkansas: vicinity of Radding (Young, 1946:14, as *F. concolor*).

Felis concolor costaricensis Merriam

1901. *Felis bangsi costaricensis* Merriam, Proc. Washington Acad. Sci., 3:596, December 11, type from Boquete, Chiriquí, Panamá.
1929. *Felis concolor costaricensis*, Nelson and Goldman, Jour. Mamm., 10:347, November 11.

MARGINAL RECORDS (Goldman, 1946:241).—Costa Rica: Guapiles. Panamá: Bayano River, 10 mi. above mouth Mamoní River.

Felis concolor couguar Kerr

1792. *Felis couguar* Kerr, The animal kingdom . . . , p. 151. Type locality, Pennsylvania.
1929. *Felis concolor couguar*, Nelson and Goldman, Jour. Mamm., 10:347, November 11.

MARGINAL RECORDS.—New Brunswick: headwaters Sevogle River (Wright, 1953:14). Nova Scotia: vicinity Blue Mtn., Pictou Co. (Wright, 1953:24), thence southward along coast to South Carolina: Santee River (Young, 1946:34, as *F. concolor*). Tennessee (Young, 1946:35, as *F. concolor*): Tellico River drainage, Monroe Co.; near Nashville. Indiana (Lyon, 1936:161): Knox County; Porter County. Michigan: Mason County (Burt, 1946:166). Quebec: Lac des Quinze (Wright, 1948:238); near Sorel (Young, 1946:43, as *F. concolor*).

Felis concolor hippolestes Merriam

1897. *Felis hippolestes* Merriam, Proc. Biol. Soc. Washington, 11:219, July 15, type from Wind River Mts., near head Big Wind River, Fremont Co., Wyoming.
1929. *Felis concolor hippolestes*, Nelson and Goldman, Jour. Mamm., 10:347, November 11.

MARGINAL RECORDS (Goldman, 1946:211, unless otherwise noted).—South Dakota: junction Grand and Missouri rivers (Young, 1946:34, as *F. concolor*). Kansas (Cockrum, 1952:263): Trego County. Colorado: La Veta. New Mexico: *northern New Mexico*. Colorado: 18 mi. N Durango; Paradox; Gateway. Utah: White River, Uintah Co. (Durrant, 1952:446); Spanish Fork Canyon, 4 mi. from mouth Lake Fork, 6 mi. SE Thistle (*ibid.*); Provo; Park Valley (Durrant, 1952:446). Idaho (Davis, 1939:149–150):

9 mi. NW Pocatello. Wyoming: type locality; Wolf; head Bear Creek, Bear Lodge Mts.

Felis concolor improcera Phillips

1912. *Felis improcera* Phillips, Proc. Biol. Soc. Washington, 25:85, May 4, type from Calmallí, Baja California.

1929. *Felis concolor improcera*, Nelson and Goldman, Jour. Mamm., 10:347, November 11.

MARGINAL RECORDS (Goldman, 1946:229).—Baja California: type locality, thence southward to 10 mi. W Miraflores.

Map 479. *Felis concolor.*

Guide to subspecies

1. *F. c. azteca*
2. *F. c. browni*
3. *F. c. californica*
4. *F. c. coryi*
5. *F. c. costaricensis*
6. *F. c. couguar*
7. *F. c. hippolestes*
8. *F. c. improcera*
9. *F. c. kaibabensis*
10. *F. c. mayensis*
11. *F. c. missoulensis*
12. *F. c. oregonensis*
13. *F. c. schorgeri*
14. *F. c. stanleyana*
15. *F. c. vancouverensis*

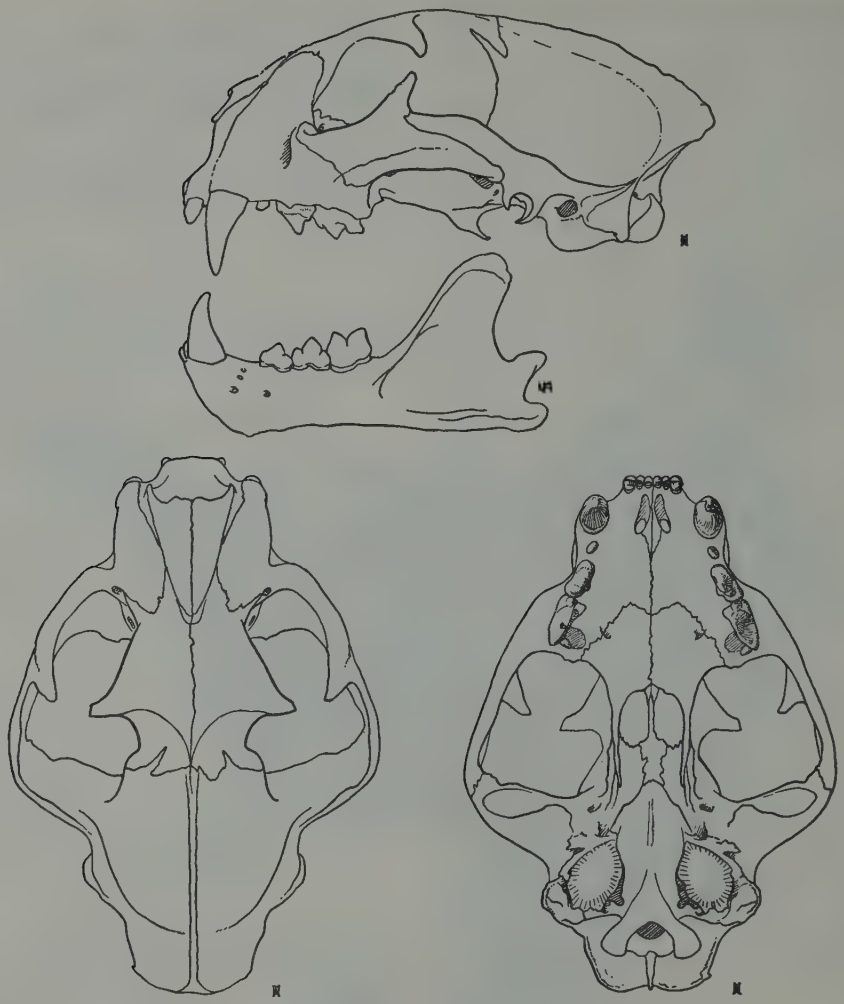


Fig. 505. *Felis concolor kaibabensis*, Potts, Nevada, No. 37295 M.V.Z., ♂, X ¾.

Felis concolor kaibabensis Nelson and Goldman

1931. *Felis concolor kaibabensis* Nelson and Goldman, Jour. Washington Acad. Sci., 21:209, May 19, type from Powell Plateau, 8700 ft., Grand Canyon National Park, Coconino Co., Arizona.

MARGINAL RECORDS (Goldman, 1946:224–225, unless otherwise noted).—Nevada: Cold Creek, Ruby Mts. (Hall, 1946:275); Spruce Mtn. Utah: Deep Creek Mts. (Durrant, 1952:447); Antelope, near Manti (*ibid.*); Thousand Lake Mtn. Arizona: Bright Angel, Grand Canyon National Park. Utah: Pine Valley Mts.; Modena. Nevada: 15 mi. W Sunnyside; Hot Creek, near Keystone; head left fork Shady Run, Stillwater Range (Hall, 1946:275).

Felis concolor mayensis Nelson and Goldman

1929. *Felis concolor mayensis* Nelson and Goldman, Jour. Mamm., 10:350, November 11, type from La Libertad, Petén, Guatemala.

MARGINAL RECORDS.—Veracruz: Catemaco (Goldman, 1946:239), thence along coast to Guatemala: *lowland forests of both slopes* (Handley, 1950:148); *mountains of Alta Vera Paz and Quiché* (*ibid.*). Veracruz: 20 km. ENE Jesús Carranza, 200 ft. (33751 KU).

Felis concolor missoulensis Goldman

1943. *Felis concolor missoulensis* Goldman, Jour. Mamm., 24:229, June 7, type from Sleeman Creek, about 10 mi. SW Missoula, Montana Co., Montana.

MARGINAL RECORDS (Goldman, 1946:207–208, unless otherwise noted).—British Columbia (Cowan and Guiguet, 1956:337): Big Muddy River; East Pine. Alberta: Clearwater River, 50 mi. NW Banff; back of Interlaken towards Jacques Lake, Jasper National Park. Saskatchewan (Young, 1946:43, as *F. concolor*): farm S of Kindersley. North Dakota: Fort Union. Montana: Fort Keogh [= Keough]. Wyoming: Wapiti River; Buffalo River, about 20 mi. SE Jackson Lake. Idaho: Sheep Creek, Boise National Forest. Oregon: Upper Imnaha River. Washington (Dalquest, 1948: 237): Blue Mts.; Republic. British Columbia: Nelson (Cowan and Guiguet, 1956:337); confluence Cypress Creek and Halfway River; S of Hudson Hope.

Felis concolor oregonensis Rafinesque

1832. *Felix* [*sic*] *oregonensis* Rafinesque, Atlantic Jour., 1:62, June 20. Type locality, Ohanapecosh River, Mt. Rainier National Park, Pierce Co., Washington (by restriction, Nelson and Goldman, Proc. Biol. Soc. Washington, 45:105, July 15, 1932).

1904. [*Felis*] *concolor oregonensis*, Elliot, Field Columb. Mus., Publ. 95, Zool. Ser., 4:454, August 2.

1897. *Felis hippolestes olympus* Merriam, Proc. Biol. Soc. Washington, 11:220, July 15, type from Lake Cushman, Olympic Mts., Mason Co., Washington. (Regarded as inseparable from *oregonensis* by Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 2:237, April 9, 1948.)

MARGINAL RECORDS (Goldman, 1946:214, unless otherwise noted).—British Columbia: Bella Coola Inlet (Anderson, 1947:75); Vernon. Washington: Loomis; Dollar Mtn., near Republic; Leavenworth (Dalquest, 1948:237); Goldendale (*ibid.*). Oregon: Murderer Creek, Dayville; Rock Creek, 14 mi. NW Trail; 12 mi. E Agness; Pistol River, thence northward along coast to point of beginning.

Felis concolor schorgeri Jackson

1955. *Felis concolor schorgeri* Jackson, Proc. Biol. Soc. Washington, 68:149, October 31, type from near Appleton, Outagamie Co., Wisconsin.

MARGINAL RECORDS.—Ontario: Beardmore (Dear, 1955:26). Michigan (Burt, 1946:166, as *F. c. couguar*): Marquette County. Wisconsin: type locality. Illinois: Cook County (Young, 1946:20, as *F. concolor*). Missouri: vicinity of St. Louis (Young, 1946:26, as *F. concolor*). Kansas: Harper County (Cockrum, 1952:263, as *F. c. hippolestes*); Barber County (*ibid.*); Comanche County (*ibid.*); Catherine (Jackson, 1955:150). Minnesota: 8½ mi. S Williams (Magnus, 1956:43); Duluth (Jackson, 1955:155). Ontario: about 43 mi. W Port Arthur (Dear, 1955:26).

Felis concolor stanleyana Goldman

1936. *Felis concolor youngi* Goldman, Proc. Biol. Soc. Washington, 49:137, August 22, type from Bruni Ranch, near Bruni, Webb Co., Texas. Not *Felis youngi* Pei, Palaeont. Sinica, ser. c, 8(1):133, May, 1934.

1938. *Felis concolor stanleyana* Goldman, Proc. Biol. Soc. Washington, 51:63, March 18, a renaming of *F. c. youngi* Goldman.

MARGINAL RECORDS.—Texas: Memphis (Goldman, 1946:234). Oklahoma: near mouth Cache Creek, headwaters of Red River (Young, 1946:32, as *F. concolor*). Texas: Phoenix Dairy Pasture, 15 mi. S Rock Island (Baker, 1949:199); Brazoria County (*ibid.*), thence along coast to Tamaulipas: Miquihuana, 6400 ft. (56003 KU). Chihuahua: Sierra Almagre, 5400 ft., 12 mi. S Jaco (57002 KU). Texas: Presidio County (Goldman, 1946:234); *25 mi. N Van Horn* (*ibid.*); Burned Cabin, near head McKittrick Canyon, Culberson Co. (Davis and Robertson, 1944:265).

Felis concolor vancouverensis Nelson and Goldman

1932. *Felis concolor vancouverensis* Nelson and Goldman, Proc. Biol. Soc. Washington, 45:105, July 15, type from Campbell Lake, Vancouver Island, British Columbia.

MARGINAL RECORDS (Goldman, 1946:216).—British Columbia (Vancouver Island): Quatsino, thence southward to within 20 mi. of Victoria.

Felis pardalis
Ocelot

North American subspecies revised by Goldman, Jour. Mamm., 24:375–380, August 17, 1943.

External measurements: (♂) 950–1367; 280–400; 132–180; (♀) 920–1209; 270–371; 130–173. Greatest length of skull, (♂) 121.0–158.0, (♀) 120.0–140.7; zygomatic breadth, (♂) 81.0–108.0, (♀) 80.0–96.4; crown length of maxillary tooth-row, (♂) 35.5–47.1, (♀) 35.1–39.6. Ground color of upper parts grayish to cinnamon; dark markings forming chainlike streaks, generally forming black-bordered elongated spots, which run obliquely down sides; area enclosed by black that usually is more intense than ground color; head with small black spots and two black stripes on each cheek; 4 or 5 parallel black stripes on neck; ground color of sides paler than dorsum; underparts and inner surfaces of limbs whitish; tail above marked with dark bars or blotches.

Ocelots are good climbers and inhabit forested or brushy areas where they feed on small and moderate-sized mammals and birds. These cats generally are nocturnal, but not uncommonly are seen during the day. Little is known of the reproduction of ocelots; 2 young per litter have been recorded. The young are born from September to January.

Map 480. *Felis pardalis.*

1. *F. p. albescens* 2. *F. p. mearnsi* 3. *F. p. nelsoni* 4. *F. p. pardalis* 5. *F. p. sonoriensis*

Felis pardalis albescens Pucheran

1855. *Felis albescens* Pucheran, *in* I. Geoffroy Saint-Hilaire, Mammifères, *in* Petit-Thoaurs, Voyage autour du monde sur . . . la *Venus* . . . , Zoologie, p. 149. Type locality, Arkansas.

1906. *Felis pardalis albescens*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 22:219, July 25.

1901. *Felis limitis* Mearns, Proc. Biol. Soc. Washington, 14: 146, August 9, type from Brownsville, Cameron Co., Texas.

1911. *Felis ludoviciana* Brass, Aus dem Reiche der Pelze, p. 411, April, a renaming of *F. limitis.*

MARGINAL RECORDS.—Texas: 2½ mi. NE Hedley (Davis, 1951:364). Arkansas: *type locality.* Texas: 18 mi. E Bay City (Goldman, 1943:380), thence southward along Gulf Coast to Tamaulipas: Soto la Marina (*ibid.*). Texas: Alamo de Cesarea Ranch, between Marfa and Terlingua (Goldman, 1943:380).

Felis pardalis mearnsi J. A. Allen

1902. *Felis costaricensis*, Mearns, Proc. U.S. Nat. Mus., 25: 245, September 17, type from Talamanca, Limón, Costa Rica. Not *Felis bangsi costaricensis* Merriam, 1901.

1904. *Felis mearnsi* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:71, February 29, a renaming of *F. costaricensis* Mearns.

1909. *Felis pardalis mearnsi*, Lyon and Osgood, Bull. U.S. Nat. Mus., 62:208, January 28.

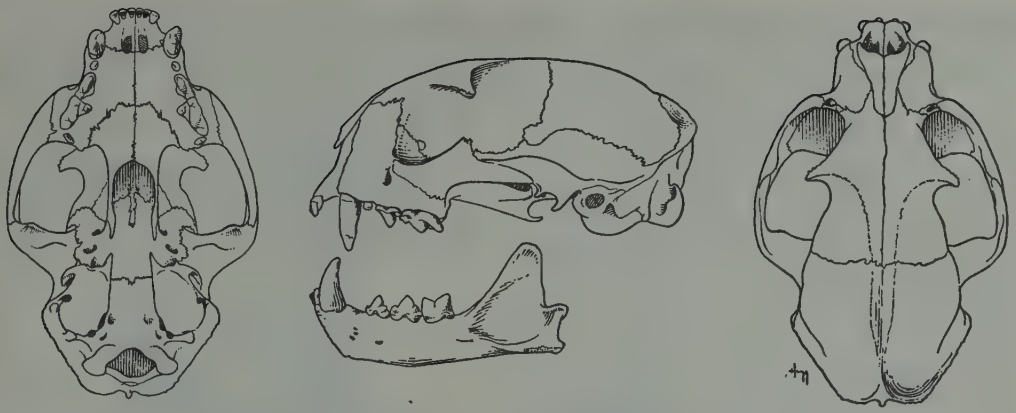


Fig. 506. *Felis pardalis albescens*, Brownsville, Texas, No. 2209 K.U., ♂, X ½.

1860. *Felis pardalis minimus* Wilson, Proc. Acad. Nat. Sci. Philadelphia, p. 82. Type locality, Realjo, Nicaragua. Based on a kitten which was lost; if based on an ocelot, this name may apply to the subspecies for which we now use the name *F. p. mearnsi*.

MARGINAL RECORDS.—Nicaragua: Río Choco (Pocock, 1941:341), thence southeastward through Central America to Colombia in South America.

Felis pardalis nelsoni Goldman

1925. *Felis pardalis nelsoni* Goldman, Jour. Mamm., 6:122, May 12, type from Manzanillo, 50 ft., Colima.

MARGINAL RECORDS (Goldman, 1943:378, unless otherwise noted).—Sinaloa: Los Limones (J. A. Allen, 1906: 219, as *F. p. albescens*). Guerrero: Omilteme. Oaxaca: Puerto Angel, thence northward along Pacific Coast to Sinaloa: Escuinapa.

Felis pardalis pardalis Linnaeus

1758. [*Felis*] *pardalis* Linnaeus, Syst. nat., ed. 10, 1:42. Type locality, State of Veracruz (by restriction, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 41:345, October 3, 1919).

1792. *Felis mexicana* Kerr, The animal kingdom . . . , p. 151, may refer to this subspecies.

1795. *Felis ocelot* Link, Beyträge zur Naturgeschichte, 2:90, based on *Felis pardalis* Linnaeus.

1830. *Felis griffithii* Fischer, Synopsis mammalium, p. 369 (= 569). Type locality, probably México.

1838. *Felis canescens* Swainson, Animals in menageries, p. 118, a renaming of *F. griffithii* Fischer.

1842. *Leopardus griseus* Gray, Ann. Mag. Nat. Hist., ser. 1, 10:260, December, type from Guatemala.

1842. *Felis pseudopardalis* Boitard, Jardin des Plantes . . . , p. 187, may refer to this subspecies.

1911. ? *Felis buffoni* Brass, Aus dem Reiche der Pelze, p. 412, April. Type locality, México.

1911. ? *Felis mexicana* Brass, Aus dem Reiche der Pelze, p. 412, April. Type locality, México. Not *F. mexicana* Desmarest, 1816, nor *F. mexicana* Saussure, 1860.

MARGINAL RECORDS.—Tamaulipas: 10 mi. N Altamira (57005 KU), thence southward along coast to Honduras (Goldman, 1943:377): Balfate, Archaga, 20 km. N Tegucigalpa, thence northwestward along Pacific Coast to Oaxaca: Tehuantepec (Pocock, 1941:346). Veracruz (Goldman, 1943:377): Pérez; Mirador. San Luis Potosí: 17 km. W Ebano (Dalquest, 1953b:201).

Felis pardalis sonoriensis Goldman

1925. *Felis pardalis sonoriensis* Goldman, Jour. Mamm., 24: 378, August 17, type from Camoa, Río Mayo, Sonora.

MARGINAL RECORDS.—Arizona: Ft. Verde (Goldman, 1943:379). Sonora: Guirocoba (Burt, 1938:34). Sinaloa: Mazatlán (Pocock, 1941:350). Sonora: type locality. Not found, Sinaloa: Los Pieles (J. A. Allen, 1906:219).

Felis wiedii
Margay

North American subspecies revised by Goldman, Jour. Mamm., 24:380–85, August 17, 1943.

External measurements: (♂) 862–1300; 331–510; 102–130; (♀) 805–1029; 342–440; 89–132.

Greatest length of skull, (♂) 89.0–107.0, (♀) 86.1–100.6; zygomatic breadth, (♂) 61.3–72.2, (♀) 59.6–65.8; crown length of maxillary tooth-row, (♂) 27.2–29.4, (♀) 24.7–29.4. "Ground color of upper parts Clay Color, slightly darker along mid-dorsal line and slightly grayer on head; eye ring black; cheeks Cinnamon with narrow area of white between cheek and eye; top of muzzle dull Cinnamon; top of head near Tawny-Olive with two narrow lines of black extending posteriorly from above eyes to between ears and enclosing numerous flecks of black; backs of ears black with round white spot, 7 mm. in diameter; back of neck with five parallel lines; median line narrow and not distinct; second lines heavy and distinct, 10 mm. wide; outer lines narrow, 6 mm. wide, but distinct; indistinct, broken area of black, enclosing narrow line of Clay Color or Tawny-Olive, extending along median line from shoulders to rump; rest of upper parts Clay Color with numerous irregular black spots, averaging 20 mm. in diameter, and enclosing small areas of Tawny-Olive; lower on sides, spots tending to break up and become elongated; pair of broad, black transverse bars on each shoulder surrounding areas of Tawny-Olive; front and back legs with numerous black spots, often oriented transversely; under parts white with numerous solid black spots; tail Tawny-Olive with numerous irregular black spots, forming complete rings near tip." (Dalquest, 1953b: 201–202, description of specimen from San Luis Potosí.)

F. wiedii resembles a small, long-tailed *F. pardalis*. Differences from *pardalis* are: skull smaller; postorbital constriction shallower; orbit relatively larger; postorbital processes relatively longer and slenderer (fusing with jugals in some skulls); dorsal contour of skull evenly convex from nasals to occiput; sagittal crest absent; temporal crests lyriform. We know nothing about the habits of this species.

Felis wiedii cooperi Goldman

1943. *Felis wiedii cooperi* Goldman, Jour. Mamm., 24:384, August 17, type from Eagle Pass, Maverick Co., Texas. Known only from type locality.

Felis wiedii glaucula Thomas

1903. *Felis glaucula* Thomas, Ann. Mag. Nat. Hist., ser. 7, 12:235, August, type from Beltrán, Jalisco.
1943. *Felis wiedii glaucula*, Goldman, Jour. Mamm., 24: 384, August 17.

MARGINAL RECORDS.—Sinaloa: Tatemales (Goldman, 1943:384). Jalisco: Los Masos (Goldman, 1943:384). Not found, Jalisco: type locality.

Felis wiedii nicaraguae (J. A. Allen)

1919. *Margay glaucula nicaraguae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 41:357, October 3, type from Volcán de Chinandega, Chinandega, Nicaragua.
1943. *Felis wiedii nicaraguae*, Goldman, Jour. Mamm., 24: 382, August 17.

MARGINAL RECORDS.—Honduras (Goldman, 1943: 382): Santa Bárbara; Guaymaca. Nicaragua (*ibid.*): Matagalpa. Costa Rica: Santa Clara (Goodwin, 1946:442); Cañas Gordas (Goldman, 1943:382). Nicaragua: type locality.

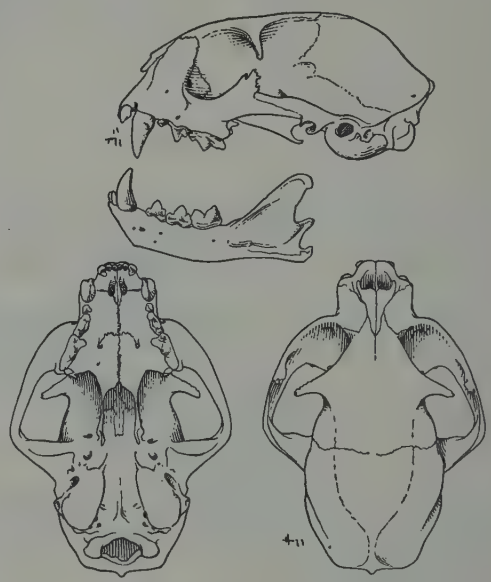


Fig. 507. *Felis wiedii nicaraguae*, Canas Gordas, Costa Rica, No. 141989 A.M., ♂, X ½.

Felis wiedii oaxacensis Nelson and Goldman

1860. *Felis mexicana* Saussure, Revue et Mag. Zool., Paris, ser. 2, 1:12, January. Type locality, Alvarado, Veracruz. Not *F. mexicana* Desmarest, 1816.
1931. *Felis glaucula oaxacensis* Nelson and Goldman, Jour. Mamm., 12:303, August 24, type from Cerro San Felipe, 10,000 ft., near Oaxaca, Oaxaca.
1943. *Felis wiedii oaxacensis*, Goldman, Jour. Mamm., 24: 383, August 17.

MARGINAL RECORDS.—Tamaulipas: Rancho del Cielo (Goodwin, 1954:15). Veracruz: Alvarado (Saussure, 1860: 4). Oaxaca: type locality. Veracruz: Córdoba (Dalquest, 1950:14). San Luis Potosí: Apetsco (Dalquest, 1953b:302).

Felis wiedii pirrensis Goldman

1914. *Felis pirrensis* Goldman, Smiths. Miscl. Coll., 63(5):4, March 14 type from Cana, 2000 ft., Darien, Panamá.

Map 481. *Felis wiedii.*

Guide to subspecies
1. *F. w. cooperi*
2. *F. w. glaucula*
3. *F. w. nicaraguae*
4. *F. w. oaxacensis*
5. *F. w. pirrensis*
6. *F. w. salvinia*
7. *F. w. yucatanica*

1943. *Felis wiedii pirrensis*, Goldman, Jour. Mamm., 24:380, August 17.

MARGINAL RECORDS.—Panamá: Calcobevora (Pocock, 1941:361); type locality, thence into South America.

Felis wiedii salvinia (Pocock)

1941. *Leopardus wiedii salvinia* Pocock, Field Mus. Nat. Hist., Publ. 511, Zool. Ser., 27:366, December 8, type from Vera Paz, Guatemala.
1943. *Felis wiedii salvinia*, Goldman, Jour. Mamm., 24:382, August 17.

MARGINAL RECORDS.—Guatemala: type locality; Dueñas (Pocock, 1941:366).

Felis wiedii yucatanica Nelson and Goldman

1931. *Felis glaucula yucatanica* Nelson and Goldman, Jour. Mamm., 12:304, August 24, type from Mérida, Yucatán.
1943. *Felis wiedii yucatanica*, Goldman, Jour. Mamm., 24: 382, August 17.

MARGINAL RECORDS.—Yucatán: type locality, thence around peninsula to British Honduras: near Uaxactún (Murie, 1935:22). Chiapas: Tecpactán (Goldman, 1943: 383).

Felis tigrina
Little Spotted Cat

External measurements: 755–970; 255–420; 98–110; 38–41. Greatest length of skull, 83–88; zygomatic breadth, 49.5–59.3; palatal length, 30–31; length of P4, 9.6–10.7. Ground color of upper parts light fulvous, becoming lighter on sides and belly; face with white supraorbital line; black frontal lines interrupted; back of ears black, whitish patch at base small, but well defined; black median nuchal line present in some; two pairs strong black lines and third indistinct one on sides of neck; mid-dorsal line interrupted; laterally lines change to rosettes about 1 in. in diameter, with dark fulvous centers; belly and limbs spotted; chin, chest, and groins whitish, with little spotting; belly heavily spotted; limbs dull yellowish fulvous, spots becoming smaller distally, disappearing on digits; tail with 11 to 13 black rings, broader than light intervening spaces.

Skull small and delicate, smooth, and with only a poorly developed lambdoidal crest; face short; nasals not markedly convex above; postorbital processes small and weak; braincase only slightly constricted; bullae well inflated (after Thomas, 1903: 236–237). Mastoid breadth amounts to less (44.2–48.7 per cent) than half of basilar length.

Many authors have used the name *F. pardinoides* Gray, 1867, for this species that seems to have been named *F. tigrina* by Schreber in 1775.

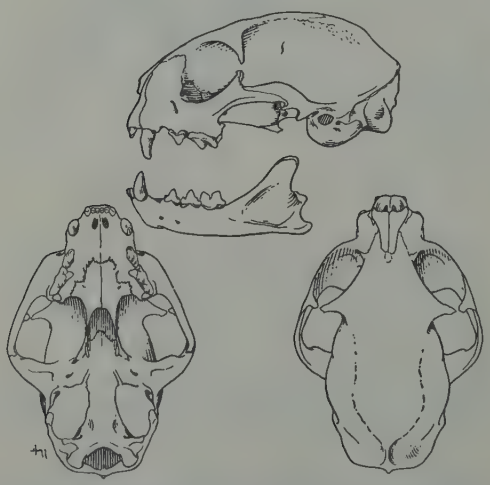
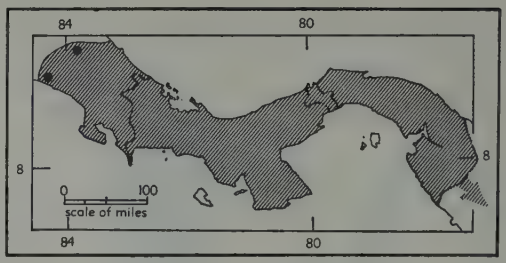


Fig. 508. *Felis tigrina emeritae* [this subspecies does not occur in North America] Andalucia, Huila, Colombia, No. 33896 A.M., ♂, X ¾.



Map 482. *Felis tigrina oncilla.*

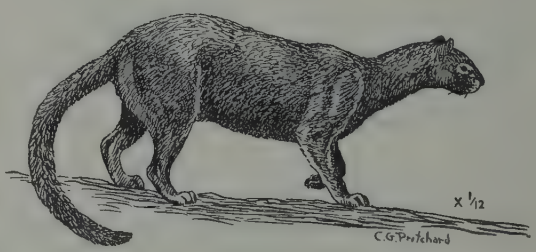
Felis tigrina oncilla Thomas

1902. *Felis pardinoides oncilla* Thomas, Ann. Mag. Nat. Hist., ser. 7, 12:237, August, type from Volcán de Irazú, Cartago, Costa Rica.

1904. *Felis carrikeri* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:47, February 29, type from Pozo Azul, Río Pirrís, San José Province, Costa Rica.

MARGINAL RECORDS.—Costa Rica: type locality; Pozo Azul (Goodwin, 1946:442).

Felis yagouaroundi
Jaguarundi



External measurements: 888–1372; 330–609; 120–152; 25–40. Greatest length of skull, 89.3–115.5; zygomatic breadth, 60.0–74.5; crown length of maxillary tooth-row, 27.5–32.5. Body elongate, head long and low, ears small. Upper parts unspotted, dichromatic: blackish to brownish-gray or reddish-yellow to chestnut. Cranium long, never strongly convex longitudinally; facial area short; temporal crests almost always separated, forming a lyriform area; rarely complete sagittal crest; muzzle compressed above; narrowest part of interorbital region situated forward, just behind naso-maxillary line; maxilla broad above, with nearly horizontal upper edge, rounded antero-superior angle, and nearly vertical anterior border. P1 minute or absent; mesopterygoid fossa narrowed anteriorly, with rounded angles, anterior border inflated,

notched; inner chamber of auditory bulla never much inflated anteriorly, not projecting far beyond the low partition; occipital crest not appreciably concave above condyles.

Jaguarundis frequent chaparral and dense forests, seemingly having a preference for localities near streams. They are active day or night and feed on small mammals and birds. According to residents of México, these cats are especially fond of birds. Jaguarundis seem to be less arboreal and more cursorial than are the smaller spotted cats of México and Central America.

Map 483. *Felis yagouaroundi.*

1. *F. y. cacomitli* 2. *F. y. fossata* 3. *F. y. panamensis* 4. *F. y. tolteca*

Felis yagouaroundi cacomitli Berlandier

1859. *Felis cacomitli* Berlandier, *in* Baird, Mammals of the boundary, *in* Emory, Rept. U.S. and Mexican boundary survey, 2(2):12, January, type from Matamoros, Tamaulipas.
1905. *Felis jaguarondi cacomitli*, Elliot, Field Columb. Mus., Publ. 105, Zool. Ser., 6:370, December 6.
1901. *Felis apache* Mearns, Proc. Biol. Soc. Washington, 14: 150, August 9, type from Matamoros, Tamaulipas.

MARGINAL RECORDS.—Texas: Starr County (Taylor and Davis, 1947:36); Willacy County (*ibid.*), thence southward along coast to Veracruz: Mirador (6950/8571 NM). San Luis Potosí: near Ebano (Dalquest, 1953b:204); vicinity Xilitla (*op. cit.*:203). Tamaulipas: near Gómez Farías (Goodwin, 1954:15).

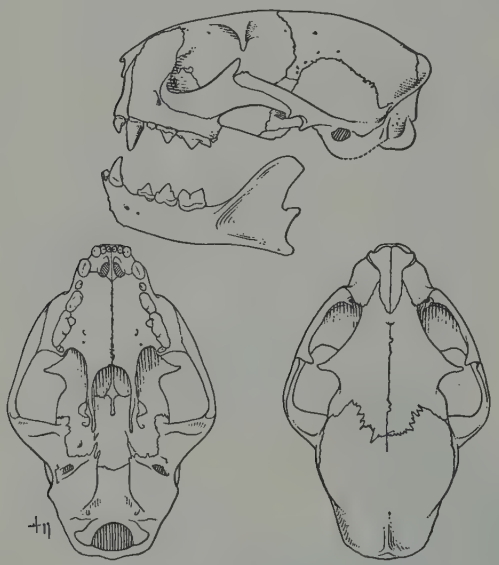


Fig. 509. *Felis yagouaroundi cacomitli*, Brownsville, Texas, No. 2219 K.U., ♂, X ½.

Felis yagouaroundi fossata Mearns

1901. *Felis fossata* Mearns, Proc. Biol. Soc. Washington, 14: 150, August 9, type from Mérida, Yucatán.
1942. *Felis* (*yagouaroundi*) *fossata*, Goodwin, Bull. Amer. Mus. Nat. Hist., 79:186, May 29.

MARGINAL RECORDS.—Veracruz: Río Blanco, 20 km. WNW Piedras Negras (17903 KU), thence along coast to Honduras (Goodwin, 1942:186): La Flor Archaga; Muin. Guatemala: Finca Ciprés (Goodwin, 1934:24). Oaxaca: Tehuantepec (9532 NM). Veracruz: 15 km. SW Jimba, 750 ft. (19280 KU).

Felis yagouaroundi panamensis J. A. Allen

1904. *Felis panamensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:71, February 29, type from Boquerón, Chiriquí, Panamá.
1946. *Felis yaguarondi* [*sic*] *panamensis*, Goodwin, Bull. Amer. Mus. Nat. Hist., 87:443, December 31.

MARGINAL RECORDS.—Costa Rica (Goodwin, 1946: 443): Catalina; San José, thence eastward throughout Panamá and into South America.

Felis yagouaroundi tolteca Thomas

1898. *Felis yaguarondi* [*sic*] *tolteca* Thomas, Ann. Mag. Nat. Hist., ser. 7, 1:41, January, type from Tatemales, Sinaloa.

MARGINAL RECORDS.—Arizona: about 3 mi. E Canelo R.S., Coronado National Forest, Santa Cruz Co. (Little, 1938:500). Nayarit: 1 mi. N San Blas, 10 ft. (40179 KU). Sinaloa: Escuinapa (J. A. Allen, 1906:222, as *F. cacomitli*), thence northward to point of beginning.

Genus Lynx Kerr—Lynx and Bobcat

1792. *Lynx* Kerr, The animal kingdom . . . , 1:155. Type, *Lynx vulgaris* Kerr [= *Felis lynx* Linnaeus].
1821. *Lynceus* Gray, London Med. Repos., 15:302, April 1. Type, *Felis lynx* Linnaeus. Not *Lynceus* Müller, 1785, a crustacean.
1825. *Lyncus* Gray, Thompson's Ann. Philos., 26:339, November, a renaming of *Lynceus* Gray, 1821.
1829. *Pardina* Kaup, Skizzirte Entwickelungs—Geschichte und natürliches System der Europäischen Thierwelt, 1:53. Type, *Felis pardina* Temminck.
1834. *Lynchus* Jardine, The naturalist's library, 2:274, an emendation of *Lynceus* Gray.
1843. *Caracal* Gray, List of the . . . Mammalia in the . . . British Museum, p. 46. Type, *Felis caracal* Schreber.
1858. *Urolynchus* Severtzow, Revue et Mag. Zool., Paris, ser. 2, 10:389, September. Type, *Felis caracal* Schreber.
1867. *Cervaria* Gray, Proc. Zool. Soc. London, p. 276, October. Type, *Lyncus pardinus* [= *Felis pardina* Temminck]. Not *Cervaria* Walker, 1866, a lepidopteran.
1903. *Eucervaria* Palmer, Science, n. s., 17:873, May 29, a renaming of *Cervaria* Gray, 1867.

Medium-sized cats with short tails, large, triangular, tufted ears, large paws, broad, short heads. Cranial characters essentially as in *Felis*, but with nasal branch of premaxillae slender and gradually attenuated; postorbital processes thinner, less depressed and sharper; notching of suborbital edge of palate shallower; and premolars $\frac{2}{2}$.

KEY TO NORTH AMERICAN SPECIES OF LYNX

1. Tail tipped with black above and below; tail less than ½ length of hind foot; anterior condyloid foramen separate from foramen lacerum posterius. . . . *L. canadensis*, p. 967
1′. Tail tipped with black only above; tail more than ½ length of hind foot; anterior condyloid foramen confluent with foramen lacerum posterius. . . . . *L. rufus*, p. 968

Lynx canadensis
Lynx

External measurements: 825–954; 95–125; 203–250. Weight, 6.8–18.1 kg. Greatest length of skull, 120–136; zygomatic breadth, 82–93; alveolar length of maxillary tooth-row, 38.1–41.6. Females are smaller than males. "Legs long; feet large; pads well furred. Color: Upper parts a mixture of Ochraceous-Tawny, dark brown and black sprinkled with white; all guard hairs white subterminally and black terminally and darkest middorsally; underfur Cinnamon Brown; top of head like back, but heavily suffused with white-tipped hairs; eyelids white; ears buffy brown at base, with central white spot; dorsal margin of ears brown, terminating in a long, slender black tuft; ears white inside; ruff well developed, consisting of white, black, and brown and white hairs; sides and flanks Ochraceous-Buff, sprinkled with white, guard hairs white subterminally, black terminally; tail Cinnamon above, white beneath, black-tipped; feet and legs buffy white; chin and throat white; underparts buffy white sparsely mottled with light brown. Skull: Large; postorbital processes of frontals small; presphenoid wide transversely, but constricted anteroposteriorly; posterior palatine foramina situated near orbital rim of palate; anterior margin of interpterygoid fossa semicircular; anterior condyloid foramen separate from foramen lacerum posterius" (Durrant, 1952:438–439).

The lynx inhabits heavily forested areas and rarely ventures far from the shelter of trees. Although squirrels, grouse, lemmings, and other small animals are eaten, the snowshoe rabbit is the principal food and the size of the population of the lynx is correlated with the abundance of the rabbit. The lynx breeds in March, and the young (1–4) are born after a gestation period of 2 months.

Lynx canadensis canadensis Kerr

1792. *Lynx canadensis* Kerr, The animal kingdom . . . , 1:157. Type locality, Eastern Canada [= Quebec].
1900. *Lynx canadensis mollipilosis* Stone, Proc. Acad. Nat. Sci. Philadelphia, 52:48, March 24, type from Wainwright Inlet [*sic*], Point Barrow, Alaska.

MARGINAL RECORDS.—Alaska: Point Barrow (Anderson, 1937:108). Mackenzie: Franklin Bay (Anderson, 1947: 76); E shore Artillery Lake (J. A. Allen, 1910:10). Manitoba: York Factory (Preble, 1902:61). District of Franklin: *Baffin Island* (Soper, 1944:236), thence southward along Atlantic Coast of continental North America to Connecticut: Southington (Goodwin, 1935:87). Pennsylvania: "*southern borders*" (Rhoads, 1903:136). Indiana: Knox County (Lyon, 1936:163). Iowa (Scott, 1937:67): island S of

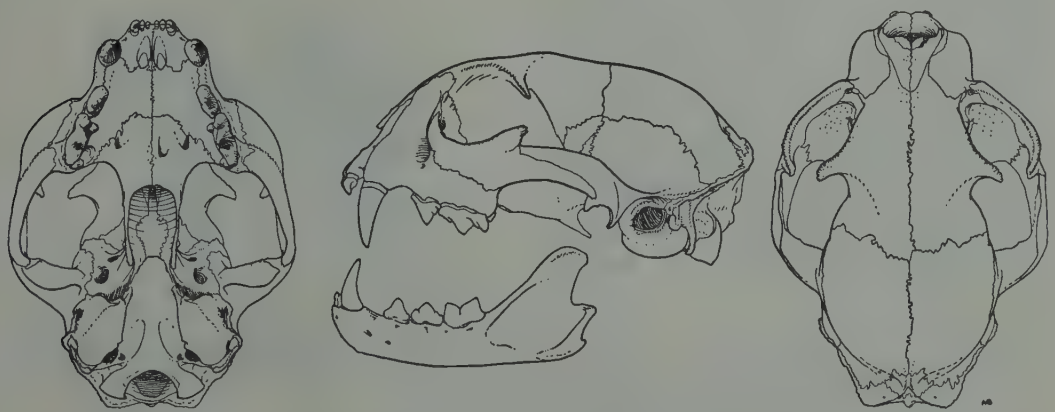


Fig. 510. *Lynx canadensis canadensis*, Kusilif, Alaska, No. 4214 M.V.Z., ♂. Lower jaw is of ♀ 48081 K.U., Wonder Lake, Mt. McKinley Dist., Alaska. X ½.

Map 484. *Lynx canadensis.*

1. *L. c. canadensis* 2. *L. c. subsolanus*

Muscatine; Sac County. Nebraska (Swenk, 1908:118): Norfolk. South Dakota: Fort Sisseton (V. Bailey, 1927:147). North Dakota: about 6 mi. S Cannon Ball (*ibid.*). Colorado (Cary, 1911:165–167): Grand Lake; vicinity Mt. Lincoln; mountains N Pagosa Springs; La Plata; region about Snow Mass Peak; Elk Head Mts. Utah (Durrant, 1952:440): Bald Ridge, near top Manti Forest Range, W Joes Valley, about 25 mi. W and a little N of Orangeville in Emery Co., and about the same distance NE Ephraim in Sanpete Co.; N. fork Provo River. Idaho: 22 mi. N Hill City (Davis, 1939: 150). Nevada: Little Owyhee River (Schantz, 1947:292). Oregon (V. Bailey, 1936:271): Kiger Creek, Steens [Mts.]; Fort Klamath, thence northward along Pacific Coast to Alaska: mountains near Unalakleet (Osgood, 1900a:40); barren country back of Wainwright (A. M. Bailey and Hendee, 1926:16).

Lynx canadensis subsolanus Bangs

1897. *Lynx subsolanus* Bangs, Proc. Biol. Soc. Washington, 11:49, March 16, type from Codroy, Newfoundland. Known only from Newfoundland.

1901. [*Lynx canadensis*] *subsolanus*, Elliot, Field Columb. Mus., Publ. 45, Zool. Ser., 2:296, March 6.

Lynx rufus
Bobcat

Eastern subspecies revised by Peterson and Downing, Contrib. Royal Ontario Mus. Zool. and Palaeo., 33:1–23, April 8, 1952; Californian subspecies revised by Grinnell and Dixon, Univ. California Publ. Zool., 21:339–354, January 24, 1924.

External measurements: (♂) 787–1252; 130–195; 158–223; 61–77 (crown); (♀) 710–1219; 95–

170; 143–180; 63–76 (crown). Weight: (♂) 7.2–31.0 kg., (♀) 5.7–24.0 kg. Greatest length of skull, (♂) 114.5–149.5, (♀) 105.8–137.4; zygomatic breadth, (♂) 82.2–107.1, (♀) 75.2–90.5; alveolar length of maxillary tooth-row, (♂) 35.9–43.1, (♀) 33.7–35.6. Upper parts grayish, buffy, or reddish, usually with black spots; color most intense middorsally, becoming lighter laterally; rump and hind legs buffy; ears blackish with white spot near tip, tufted; eyelids white; underparts and inner side of legs whitish, with black spots; tail with indistinct black rings, tipped with black above, whitish below. Skull robust; sagittal crests lyrate; lambdoidal crest and inion well developed; tympanic bullae large; postorbital processes prominent; presphenoid elongate; anterior condyloid foramen confluent with foramen lacerum posterius.

Bobcats inhabit scrub, thickets, and broken country, in contrast to the lynx, which prefers unbroken forest. The food of the bobcat is largely mice, woodrats, pocket gophers, rabbits, squirrels, chipmunks, and birds. The breeding season is in late winter, and the 1–4 (average 2.8) young are born after a gestation period of about 50 days.

Lynx rufus baileyi Merriam

1890. *Lynx baileyi* Merriam, N. Amer. Fauna, 3:79, September 11, type from Moccasin Spring, north of Colorado River, Coconino Co., Arizona.

1901. [*Lynx rufa*] *baileyi*, Elliot, Field Columb. Mus., Publ. 45, Zool. Ser., 2:297, March 6.

1897. *Lynx rufus eremicus* Mearns, Preliminary diagnoses of new mammals . . . from Mexican boundary line, p. 1, January 12 (preprint of Proc. U.S. Nat. Mus., 20:458, December 24, 1897), type from New River, near Laguna Station, Colorado Desert, Imperial Co., California.

MARGINAL RECORDS.—Colorado (Cary, 1911:167): Ft. Collins; canyons along Chief Creek, near Wray. Kansas (Cockrum, 1952–265): Oberlin; Barber County. Oklahoma: 12 mi. NE Seiling (45215 KU); *Red River Valley* (Blair, 1939:109). New Mexico: 2 mi. W, 12 mi. S Conchas Dam (42561 KU); 7 mi. NE Corona (58953 KU); Pecos River, 35 mi. N Roswell (V. Bailey, 1932:294–295). Texas: Stanton (V. Bailey, 1905:170); 8 mi. N Hot Springs (Borell and Bryant, 1942:19); E base Chisos Mts. (*ibid.*). Coahuila: 2 mi. SW Carricitos, 3500 ft. (54827 KU). Durango: Coyotes (Elliot, 1907:396). Chihuahua: Casas Grandes (*ibid.*). Sonora: Costa Rica Ranch (Burt, 1938:35). Arizona: near Rancho Bonita Well, Organ Pipe Cactus National Monument (Huey, 1942:360). California (Grinnell, *et al.*, 1937:603): near Imperial; Vallecito; Victorville; E slope Mt. Baxter, 5500 ft.; Onion Valley; Cottonwood Lakes, 11,000 ft. Nevada (Hall, 1946:282, unless otherwise noted): Desert Creek Ranch, S end of [Lyon] County; Carson River, 8 mi. W Fallon (35571 KU); Pahranagat Valley; Rainbow Canyon, Lincoln Co. Utah (Durrant, 1952:444): Beaverdam Wash, 8 mi. N Utah-Arizona border, 2800 ft.; W Kolob Peak, Washington Co.; 8½ mi. SW Orderville, 5000 ft.; Sanford Canyon, Garfield Co.; Big Hollow, Wayne Co.; Thousand Lake Mtn., Wayne Co.; Harley Dome, Grand Co. New Mexico: Dulce (V. Bailey, 1932:295). Colorado (Cary, 1911:167): Conejos River, S end San Luis Valley; Gardner; Arkins.

Lynx rufus californicus Mearns

1897. *Lynx rufus californicus* Mearns, Preliminary diagnoses of new mammals . . . from Mexican boundary line, p. 2, January 12 (preprint of Proc. U. S. Nat. Mus., 20:458, December 24, 1897), type from San Diego, San Diego Co., California.

1899. *Lynx* (*Cervaria*) *fasciatus oculeus* Bangs, Proc. New England Zool. Club, 1:23, March 31, type from Nicasio, Marin Co., California.

MARGINAL RECORDS (Grinnell, *et al.*, 1937:597–598, unless otherwise noted).—California: Mt. Shasta, 6500 ft.; McCloud River, near Baird. Nevada (Hall, 1946:279): 2½ mi. NW Lakeview; Glenbrook. California: foot of Leevining

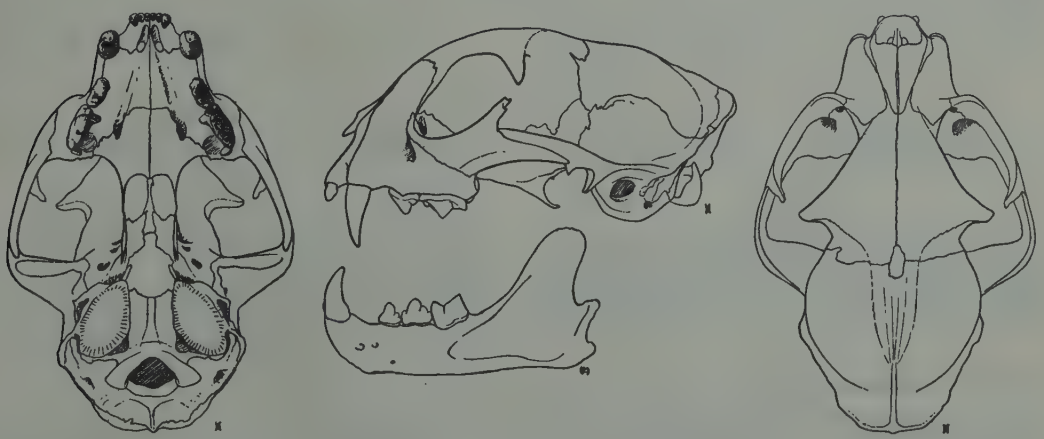


Fig. 511. *Lynx rufus pallescens*, Marble, Nevada, No. 24584 M.V.Z., ♂, X ½.

Map 485. *Lynx rufus.*

Guide to subspecies
1. *L. r. baileyi*
2. *L. r. californicus*
3. *L. r. escuinapae*
4. *L. r. fasciatus*
5. *L. r. floridanus*
6. *L. r. gigas*
7. *L. r. pallescens*
8. *L. r. peninsularis*
9. *L. r. rufus*
10. *L. r. superiorensis*
11. *L. r. texensis*

Creek grade; Piute Mts.; Riverside; San Jacinto Mts.; Santa Rosa Mts.; Campo. Baja California: Hanson Lagoon, [near] Hanson Laguna Mts. (Elliot, 1907:396). California: type locality, thence along Pacific Coast to Gualala; South Yolla Bolly Mtn.; Weaverville.

Lynx rufus escuinapae J. A. Allen

1903. *Lynx ruffus* [*sic*] *escuinapae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:614, November 14, type from Escuinapa, Sinaloa.

MARGINAL RECORDS.—Sonora: Camoa (Burt, 1938: 34). Sinaloa: type locality. San Luis Potosí (Dalquest, 1953b:205): Bledos; 6 km. S Matehuala. Veracruz: 3 km. W Limón, 7500 ft. (30000 KU). Michoacán: Pátzcuaro (Hall and Villa, 1949:449), thence westward to Pacific Coast and northward to point of beginning.

Lynx rufus fasciatus Rafinesque

1817. *Lynx fasciatus* Rafinesque, Amer. Monthly Mag., 2(1):46, November. Type locality, "Northwest Coast";

based on specimens from near mouth of Columbia River, on Netul River [= Lewis and Clark River], near Astoria, Oregon.

1901. [*Lynx rufa*] *fasciata*, Elliot, Field Columb. Mus., Publ. 45, Zool. Ser., 2:297, March 6.

MARGINAL RECORDS.—British Columbia: Westwold (39038 KU). Washington (Dalquest, 1948:243): Skykomish; Mt. Rainier; headwaters of Lewis River. Oregon (V. Bailey, 1936:270): Multnomah County; Linn County; Jackson County. California (Grinnell, *et al.*, 1937:601): Carlotta; Laytonville, thence northward along Pacific Coast to British Columbia: Alta Lake (Racey and Cowan, 1935: H22).

Lynx rufus floridanus Rafinesque

1817. *Lynx floridanus* Rafinesque, Amer. Monthly Mag., 2(1):46, November. Type locality, Florida.

1858. *Lynx rufus* var. *floridanus*, Baird, Mammals, *in* Repts. Expl. Surv. . . . , 8(1):91, July 14.

MARGINAL RECORDS (Peterson and Downing, 1952: 13–14, unless otherwise noted).—Missouri: Banner. Tennessee: *western Tennessee* (Schultz, 1954:67). *Alabama* (Howell, 1921:43). South Carolina: Aiken County; Richard County [= Richland County?]. North Carolina: Montgomery County. Virginia: Nansemond County; Dismal Swamp, thence southward along Atlantic Coast to Florida, then along Gulf Coast to Louisiana: Lake Charles (Lowery, 1943:235); Tallulah (*ibid.*).

Lynx rufus gigas Bangs

1897. *Lynx gigas* Bangs, Proc. Biol. Soc. Washington, 11:50, March 16, type from 15 mi. back of Bear River, Nova Scotia.

1952. *Lynx rufus gigas*, Peterson and Downing, Contrib. Royal Ontario Mus. Zool. and Paleo., 33:11, April 8.

MARGINAL RECORDS (Peterson and Downing, 1952: 13–14).—Nova Scotia: Colchester County, thence along coast to Maine: Hancock County (as an intergrade between *gigas* and *rufus*). New York: Franklin County (as an intergrade between *gigas* and *rufus*).

Lynx rufus pallescens Merriam

1899. *Lynx fasciatus pallescens* Merriam, N. Amer. Fauna, 16:104, October 28, type from S side Mt. Adams, near Trout Lake, Skamania Co., Washington.

1901. [*Lynx rufa*] *pallescens*, Elliot, Field Columb. Mus., Publ. 45, Zool. Ser., 2:297, March 6.

1902. *Lynx uinta* Merriam, Proc. Biol. Soc. Washington, 15: 71, March 22, type from Bridger Pass, Carbon Co., Wyoming. (Regarded by Grinnell and Dixon, Univ. California Publ. Zool., 21:350, January 24, 1924, as inseparable from *pallescens*.)

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:341): Williams Lake; Fort Steele. Alberta: Milk River between Writingonstone and Police Coulee (Soper, 1946:140). Saskatchewan: Cypress Hills (*ibid.*). North Dakota: near Garrison (18770 KU). Wyoming: 3 mi. E Bill, 4700 ft. (32338 KU); *Iron Mtn., Chugwater Creek, 20 mi. N Horse Creek* (22009 KU); 5 mi. E Horse Creek Station (57763 KU). Colorado (Warren, 1942:109): Grand County; El Paso County; Custer County; San Miguel County; 14 mi. N, 5 mi. W Mack, 5600 ft. (42560 KU). Utah (Durrant, 1952:443): S Myton; Joes Valley; W reservoir, Minersville. Nevada (Hall, 1946:279): Shingle Pass, Lincoln Co.; Monitor Valley, 8 mi. E Toquima Peak; Millett P.O.; *Marble*; 6 mi. NE Virginia City, 6000 ft. California (Grinnell, *et al.*, 1937:608): Plumas Junction; E side Eagle Lake; Straw. Oregon (V. Bailey, 1936:268): Lake County; Crook County. Washington: type locality; Lake Keechelus (Dalquest, 1948:243); Oroville (*ibid.*). British Columbia: Trinity Valley (Cowan and Guiguet, 1956:341).

Lynx rufus peninsularis Thomas

1898. *Lynx rufus peninsularis* Thomas, Ann. Mag. Nat. Hist., ser. 7, 1:42, January, type from Santa Anita, Baja California. Known only from Baja California.

Lynx rufus rufus (Schreber)

1777. *Felis rufa* Schreber, Die Säugthiere . . . , Thiel 3, Heft 95, pl. 109b. Type locality, New York. *Felis ruffus* Güldenstaedt, 1776, is not a scientific name according to J. A. Allen, Jour. Mamm., 1:91, March 2, 1920.

1817. *Lynx rufus*, Rafinesque, Amer. Monthly Mag., 2:46, November.

1817. *Lynx montanus* Rafinesque, Amer. Monthly Mag., 2:46, November. Type locality, Catskill Mountains, New York.

MARGINAL RECORDS.—Saskatchewan: Whitewood (Soper, 1946:139). Manitoba: La Riviere, Pembina Hills (*ibid.*). North Dakota: Minto (V. Bailey, 1927:150). Michigan: Presque Isle County (Burt, 1946:171). Ontario (Peterson and Downing, 1952:14): Bruce County; Simcoe County. New York: Adirondack Mts. (*ibid.*). Vermont: Addison County (*ibid.*), thence eastward to Atlantic Coast and then southward to Virginia: Buckingham County (Handley and Patton, 1947:143). North Carolina: near Mt. Mitchell (Peterson and Downing, 1952:13). Tennessee (Kellogg, 1939:269): Cherokee National Forest; Walden Ridge, near Soddy. Arkansas: state game refuge near Graysonia Park, Clark Co. (Dellinger and Black, 1940:189). Oklahoma (Blair, 1939:109): Carter County; Murray County; Osage County. Kansas (Cockrum, 1952:265): 2½ mi. SW Silverdale; Junction City. Nebraska: near Silver City [= Silver Creek] (Velich, 1954:429).

Lynx rufus superiorensis Peterson and Downing

1952. *Lynx rufus superiorensis* Peterson and Downing, Contrib. Royal Ontario Mus. Zool. and Paleo., 33:1, April 8, type from McIntyre Township, near Port Arthur, Ontario.

MARGINAL RECORDS (Peterson and Downing, 1952: 13–14).—Ontario: Onaping; 20 mi. E English River Post (*op. cit.*:17); T. 22, R. 14, Algoma Dist.; Cockburn Island. Michigan: Chippewa County; Menominee County. Wisconsin: Villas County. Minnesota: Wright County; Roseau County. Ontario: Sioux Narrows, Kenora Dist.

Lynx rufus texensis J. A. Allen

1829. *Felis maculata* Horsfield and Vigors, Zool. Jour., 4: 381, pl. 13, type from México. Not *Felis* (*Lynx*) *vulgaris maculatus* Kerr, 1792.

1895. *Lynx texensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 7:188, June 20, based on the description of a bobcat by Audubon and Bachman, The viviparous quadrupeds of North America, 2:293, 1851, from "the vicinity of Castroville, on the headwaters of the Medina [River]," Medina Co., Texas (see Audubon and Bachman, *op. cit.*:295).

1897. *Lynx rufus texensis*, Mearns, Preliminary diagnoses of new mammals . . . from the Mexican boundary line, p. 2, January 12 (preprint of Proc. U.S. Nat. Mus., 20:458, December 24).

MARGINAL RECORDS.—Texas (V. Bailey, 1905:169): Montague County; Cooke County. Louisiana: Kisatchie (Lowery, 1943:235). Texas: Sour Lake (V. Bailey, 1905: 170); Brownsville (J. A. Allen, 1906:222). Tamaulipas: [region of] San Carlos Mts. (Dice, 1937:251); Rancho Santa Rosa, 360 m. (57662 KU). Nuevo León: 7 mi. S Aramberri (58660 KU). Coahuila: 3 mi. S, 13 mi. E San Antonio de las Alanzas, 8900 ft. (58659 KU); 4 mi. E Las Margaritas, 3100 ft. (56523 KU); La Gacha, 1600 ft. (57092 KU). Texas (V. Bailey, 1905:169): Devils River; Kerr County.

Order PINNIPEDIA

North American pinnipeds monographed by J. A. Allen, U. S. Geol. and Geogr. Surv. Territories, Miscl. Publ., 12: xvi+785, 60 figs., 1880.

Limbs modified for aquatic locomotion, enclosed to elbow or knee in integument; first digit of manus usually longest, first and fifth digits of pes usually longer than three middle digits; iliac portion of pelvis short, anterior border everted; ischia barely meeting, symphysis short and ischia never ankylosed in males, ischia separated in females; skull narrow interorbitally; facial region short, broad; braincase expanded, lacrimal bones imperforate; palatine bones usually separated from frontal bones by a vacuity; tympanic bones separated from exoccipital bones; teeth simple, unspecialized; cheek-teeth all similar in structure; incisors reduced in number, never more than $\frac{3}{2}$; deciduous dentition lost early in life; Cowper's glands absent; mammae 2 or 4, abdominal; tail vestigial.

Key to North American Families of Pinnipedia

1. Hind limbs capable of rotating forward; alisphenoid canals present.
   2. Pinnae absent; upper canines enlarged, forming tusks; postorbital processes absent. . . . . Odobenidae, p. 977
   2′. Pinnae present, small; upper canines not enlarged; postorbital processes present. Otariidae, p. 973
1′. Hind limbs not capable of rotating forward; alisphenoid canals present. . . Phocidae, p. 978

Family OTARIIDAE—Eared Seals

Reviewed by Sivertsen, Sci. Results Norwegian Antarctic Exped. 1927–1928 . . . , 36:1–76, 46 figs., 10 pls., 1954. American species revised by King, Bull. British Mus., Zoology, 2(10):309–337, 3 figs., 2 pls., November, 1954.

Form slender, elongate; pinnae present, small, external conch subcylindrical; front limbs placed far back and similar to hind limbs; hind limbs capable of rotating forward; nails frequently rudimentary; ventral surface of manus and pes and most of upper surface of digits naked; skull having well-developed postorbital processes; alisphenoid canals present; mastoid processes strong, salient, distinct from small auditory bullae; canines not enlarged; scapula broad, large, having high crests and greatly developed acromion; femur having trochanter minor; ilium long; slender; acetabulum opposite posterior end of second sacral vertebra; testes scrotal.

Key to North American Genera of Otariidae

1. Postorbital processes quadrate; diastema between P4 and M1 large, 5 per cent or more of total length of skull. . . *Eumetopias*, p. 975
1′. Postorbital processes triangular; diastema between P4 and M1 small, never more than 4 per cent of total length of skull.
   2. Nasal bones short, broad, combined widths at anterior ends 80–90 per cent of length; rostral length less than 25 per cent of total length of skull. *Callorhinus*, p. 973
   2′. Nasal bones long, slender, combined widths at anterior ends 40–50 per cent of length; rostral length more than 25 per cent of total length of skull.
      3. Palate narrow, sides parallel between P1 and P3; tympanic bullae smooth, rounded; sagittal crest not greatly elevated in old males. . *Arctophoca*, p. 974
      3′ Palate broad, sides increasing in width between P1 and P3; tympanic bullae irregular; sagittal crest greatly elevated in old males. . . *Zalophus*, p. 976

Genus Callorhinus Gray—Northern Fur Seal

1859. *Callorhinus* Gray, Proc. Zool. Soc. London, p. 359, October, 1859–February, 1860. Type, *Phoca ursina* Linnaeus.

1817. *Otoes* G. Fischer, Mém. Soc. Imp. Nat. Moscou, 5: 373, 445. Based on a composite species, *Phoca jubata* Gmelin, and therefore not available (see Palmer, N. Amer. Fauna, 23:487–488, January 25, 1904).

1866. *Arctocephalus* Gill, Comm. Essex Inst., 5:7, 11, April 7. Type, *Phoca ursina* Linnaeus. Not *Arctocephalus* F. Cuvier, 1826.

1892. *Callotaria* Palmer, Proc. Biol. Soc. Washington, 7: 156, July 27, a renaming of *Callorhinus* Gray.

Total length of males, 7–8 ft., weight to 700 lbs.; total length of females, 4–5 ft., weight to 130 lbs. Males blackish to dark brownish dorsally, shoulders and neck gray, underparts and limbs reddish-brown; females gray to grayish-brown dorsally, reddish-brown or gray ventrally. Condylobasal length, (♂) 221–275, (♀) 168–200; zygomatic breadth, (♂) 115–137, (♀) 89–93; length of series of upper cheek-teeth, (♂) 49–55, (♀) 40–46. Facial portion of skull short, broad, convex, only slightly depressed; palate short, narrow, deeply notched on posterior margin; interorbital region long, approximately 20 per cent of condylobasal length; nasals short and broad, combined widths at anterior ends

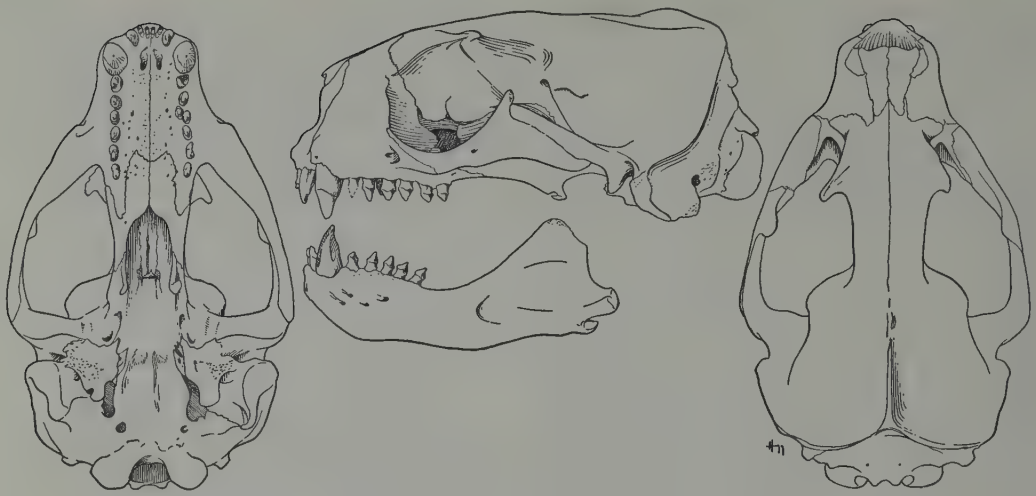


Fig. 512. *Callorhinus ursinus cynocephalus*, Pacific Grove, California, No. 2873 K.U., sex ?, X ½.

80–90 per cent of length; postorbital processes triangular. Dentition, i. $\frac{3}{2}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{2}{1}$.

Northern fur seals eat fish and squid. Males come ashore in the Pribilof Islands in late April and May and await the females, which arrive in mid-June and July. Females give birth to a single pup shortly after their arrival at the breeding grounds and are bred before early August. Delayed implantation is believed to occur. This genus is monotypic.

Callorhinus ursinus
Northern Fur Seal

See characters of the genus. Taylor, Fujinaga and Wilke (1955:61–68) regard the northern fur seal as a monotypic species.

Callorhinus ursinus cynocephalus (Walbaum)

1792. *Siren cynocephala* Walbaum, *in* Artedi, Petr. Artedi . . . ichthyologica, pt. 3, Genera piscium, p. 560. Type locality, North Pacific Ocean south of Alaska Peninsula at approximately lat. 53° N, long. 155° W (see Stejneger, Georg Wilhelm Steller . . . , pl. 12 facing p. 278, August, 1936). (Based on the sea ape of Steller; see Stejneger, *op. cit.*:285.)

1940. *Callorhinus ursina cynocephala*, Hall, California Fish and Game, 26:76, January.

1898. *Callorhinus alascanus* Jordan and Clark, *in* Jordan, The fur seals and fur-seal islands of the North Pacific Ocean, pt. 1, p. 45, type from Pribilof Islands, Alaska.

RANGE.—Alaska: E of Point Barrow (Bee and Hall, 1956: 220), thence along coast southward to California: United States-Mexico border (Kenyon and Wilke, 1953:96).

Genus **Arctophoca** Peters—Island Fur Seals

1866. *Arctophoca* Peters, Monatsb. preuss Akad. Wiss., Berlin, p. 276, pl. II, May. Type, *Otaria philippii* Peters. (Sivertsen, the latest reviser, Sci. Results Norwegian Antarctic Exped., 1927–1928 . . . , 36:40–43, 1954, regards *Arctophoca* as generically distinct from *Arctocephalus* F. Cuvier, 1826.)

Total length of males, 5–6 ft., females slightly smaller. Condylobasal length, (♂) 235–256, (♀) 197–217; zygomatic breadth, (♂) 130–140, (♀) 107–118; interorbital constriction, (♂) 26.0–30.7, (♀) 21.5–22.0. Skull narrow, interorbital breadth 10–12 per cent length of skull; postorbital processes

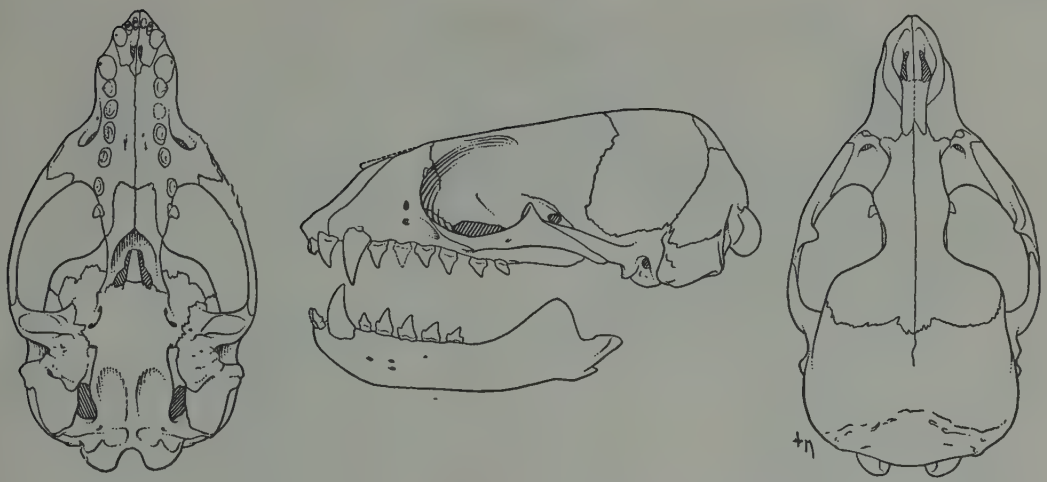


Fig. 513. *Arctophoca townsendi*, Guadalupe Island, Baja California, No. 83618 U.S.N.M., ♀, X ¼.

triangular; nasal bones long, slender; rostrum long, rostral length averaging approximately 30 per cent of total length of skull. Skull resembles that of young *Zalophus* but differs in smaller size, more rounded tympanic bullae, narrower interorbital constriction, narrower palate, larger postorbital processes, longer maxillae, broader zygomatic roots of maxillae, and less elevated sagittal crest in males. Dentition, i. $\frac{3}{2}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{2}{1}$.

Arctophoca townsendi (Merriam)
Guadalupe Fur Seal

1897. *Arctocephalus townsendi* Merriam, Proc. Biol. Soc. Washington, 11:178, July 1, type from Guadalupe Island, Baja California. Regarded by King (Bull. British Mus., Zoology, 2 (10):326, November, 1954) as identical with *Arctocephalus* [= *Arctophoca*] *philippii* (Peters, 1866).
1954. *Arctophoca townsendi*, Sivertsen, Sci. Results Norwegian Antarctic Exped., 1927–1928 . . . , 36:6.

Blackish-gray dorsally, becoming yellowish-gray on head and neck; brownish-black ventrally; lips, chin, and proximal parts of limbs rusty brown. Skull narrow; prolongations of palatine bones not thickened; zygomatic root of maxillae broad; zygomatic arch narrow; rostrum narrow; cheek-teeth lacking accessory cusps and widely spaced.

Guadalupe fur seals were almost extinct. A single male was seen in 1949 by Bartholomew (1950:175–180); however, a small breeding colony was found in 1954 by Kenyon and Scheffer (1955:10).

RANGE (King, 1954:327–328).—Formerly from California: Farallone Islands, thence southward to Baja California: San Benito Islands.

Genus Eumetopias Gill—Northern Sea Lion

1866. *Eumetopias* Gill, Comm. Essex Inst., 5:7, April 7. Type, *Arctocephalus monteriensis* Gray [= *Phoca jubata* Schreber].

Total length of males, 10–13 ft., weight to 2000 lbs.; total length of females, 7–9 ft., weight to 600 lbs. Pelage harsh, no underfur; color buff or yellowish-tan, lighter immediately after molt; naked parts of skin black; males with mane on neck. Condylobasal length, (♂) 374–400, (♀) 294–298; zygomatic breadth, (♂) 220–260, (♀) 145–173; interorbital constriction, (♂) 76–101.6 (21–27 per cent of length of skull); diastema between P4 and M1, (♂) 21–28 (5–8 per cent of total length of skull). Skull large; palate long, contracted and truncate posteriorly; postorbital processes quadrate, placed anteriorly. Dentition, i. $\frac{3}{2}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{1}{1}$.

Northern sea lions feed on squid, pollack, sand lances, flounder, sculpin, cod, herring, small sharks, perch, salmon, halibut, and sablefish. These sea lions breed at many places in their range; pups are born in June and July and females are bred shortly thereafter. This genus is monotypic.

Eumetopias jubata (Schreber)
Northern Sea Lion

1776. *Phoca jubata* Schreber, Die Säugthiere . . . , Theil 3, Heft 17, pl. 83b and p. 300 (vernacular name and description). Type locality, North Pacific Ocean.
1902. *Eumetopias jubata*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:113, March 15.
1828. *Otaria stellerii* Lesson, Dict. Class. Hist. Nat., 13:420, a renaming of *Phoca jubata* Schreber.

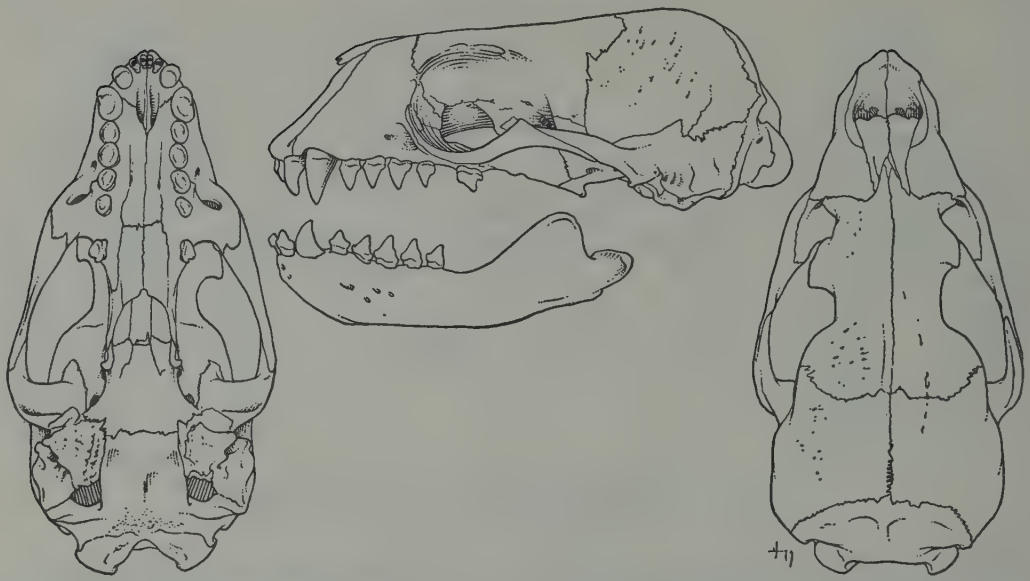


Fig. 514. *Eumetopias jubata,* Bolinas Bay, Marin Co., California, No. 48100 K.U., ♀, X ⅛.

1859. *Arctocephalus monteriensis* Gray, Proc. Zool. Soc. London, p. 358, 360, pl. 72. Type locality, Monterey, California. (Based on a skull of *Eumetopias* and a skin of *Callorhinus.*)

See characters of the genus.

RANGE (King, 1954:332–333).—Alaska: Bering Strait, thence southward to California: San Nicolas Island.

Genus **Zalophus** Gill—Sea Lions

1866. *Zalophus* Gill, Comm. Essex Inst., 5:7, April 7. Type, *Otaria gillespii* MacBain [= *Otaria californiana* Lesson].

Total length of males to 8 ft., weight to 600 lbs.; total length of females to 6 ft., weight to 200 lbs. Color blackish when wet, varying from light buff to deep sepia when dry. Muzzle broader and heavier than in *Callorhinus*; males with conspicuous crest on top of head; skull more slender and elongate than in other American otariids (except *Arctophoca*). Condylobasal length, (♂) 248–330, (♀) 195–251; zygomatic breadth, (♂) 145–180, (♀) 78–128; length of series of upper cheek-teeth, (♂) 53–58, (♀) 46–52. Sagittal crest of skull high, rising steeply from frontals in supraorbital region, reaching greatest height at level of postorbital processes of jugal bone; palate relatively short (37–47 per cent of condylobasal length); anterior nares narrow; tympanic bullae irregular in shape; zygomatic roots of maxillae narrow (5–7 per cent of condylobasal length). Dentition, i. $\frac{3}{2}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{2-1}{1}$.

Zalophus californianus (Lesson)
California Sea Lion

1828. *Otaria californiana* Lesson, Dict. Class. Hist. Nat., 13: 420. Type locality, vicinity of San Francisco Bay, California.
1880. *Zalophus californianus,* J. A. Allen, U. S. Geol. and Geogr. Surv. Territories, Miscl. Publ., 12:276.
1858. *Otaria gillespii* MacBain, Proc. Royal Soc. Edinburgh, 1:422. Type locality, California.
1866. *Otaria japonica* Peters, Monatsb. preuss. Akad. Wiss., Berlin, p. 668. Type locality, Japan.

See characters of the genus. *Z. californianus* differs from *Zalophus wollebacki* Sivertsen of the Galapagos Islands as follows: Skull larger; usually having 6 upper cheek-teeth (*wollebacki* more commonly has 5); longer snout; ratio of breadth of braincase (above jugals) to breadth of postorbital processes 93–123 per cent (in *wollebacki,* 73–88 per cent).

California sea lions feed on squid, octopuses, and a variety of fishes, breed in May and June, are polygamous, and have a single pup after a gestation period of 342–365 days.

RANGE.—British Columbia (Cowan and Guiguet, 1956: 350): Ucluelet, thence southward along coast to Nayarit: Tres Marías Islands (Nelson, 1899a:17).

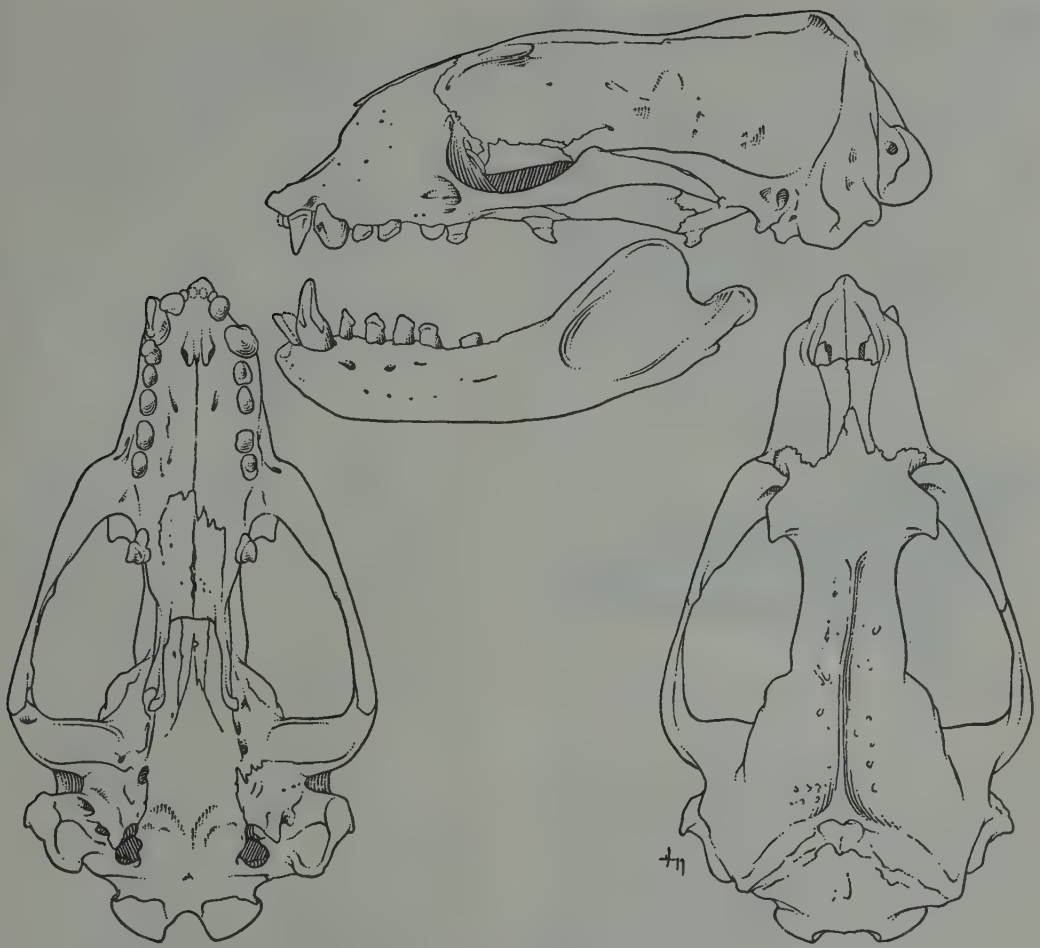


Fig. 515. *Zalophus californianus*, California, No. 2762 K.U., probably ♂, X ¼.

FAMILY ODOBENIDAE—Walrus

Body thick and heavy; head relatively short; muzzle blunt, broad, with coarse bristles; pinnae absent; hind limbs capable of being rotated forward; anterior portion of skull swollen; canines forming long tusks; postorbital processes lacking; alisphenoid canals present; surface of mastoid processes continuous with auditory bullae; scapula long, narrow; teeth single rooted, lacking distinct crowns; mammae 4.

Each foot has five toes; each toe has a nail; older animals are almost hairless.

Walruses were much hunted by the Eskimos who used the animal products thus obtained.

Genus Odobenus Brisson—Walrus

1762. *Odobenus* Brisson, Regnum animale . . . , ed. 2, p. 30. Type, *Odobenus* Brisson [= *Phoca rosmarus* Linnaeus]. Although Brisson's names are non-Linnaean and not consistently binomial (see Hopwood, Proc. Zool. Soc. London, 117:534–535, October 30, 1947, and Hershkovitz, Proc. Biol. Soc. Washington, 62:12, March 17, 1949), the International Comm. on Zool. Nomenclature (Opinion 467–16 (pt. 16): 73–88, May 31, 1957), by plenary power, validated *Odobenus* Brisson, 1762.

1766. *Trichechus* Linnaeus, Syst. nat., ed. 12, 1:49. Not *Trichechus* Linnaeus, 1758.

1772. *Rosmarus* Brünnich, Zoologiae fundamenta . . . , p. 38. Type, "Zavheften" [= *Phoca rosmarus* Linnaeus].

Total length of males to 12 ft., weight to 3000 lbs.; females approximately one-third smaller than

males. Hair short, becoming sparse with age; skin thick, wrinkled, yellowish-brown, becoming reddish-brown or chestnut on belly and at base of appendages. Condylobasal length, (♂) —— –387, (♀) 322–373; zygomatic breadth, (♂) 220–250, (♀) 184–204; length of series of upper cheek-teeth, (♂) 87–98, (♀) 63–65. See characters of the family. Functional dentition, i. $\frac{1}{0}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{0}{0}$.

The walrus inhabits ice floes of polar waters. Food consists largely of clams. Mating and calving occur on the ice in April and May. The single calf weighs 100–150 lbs. at birth, remains with female for approximately 2 years. Females do not mate the year a calf is born.

Odobenus rosmarus
Walrus

See characters of the genus and family.

Odobenus rosmarus divergens (Illiger)

1815. [*Trichechus*] *divergens* Illiger, Abh. preuss. Akad. Wiss., Berlin, 1804–1811, p. 68. Type locality, approximately 35 mi. S Icy Cape, Alaska.
1938. *Odobenus rosmarus divergens*, Barabash-Nikiforov, Jour. Mamm., 19:427, November 14.
1815. *Trichechus obesus* Illiger, Abh. preuss. Akad. Wiss., Berlin, 1804–1811, p. 64, a *nomen nudum*.
1831. *Trichechus cookii* Fremery, Bijdrag. Nat. Vetensk., 6:385. Type locality, off Icy Cape, Alaska (lat. 70° 06′ N, long. 113° 18′ W).
1922. *Trichechus orientalis* Dybowski, Arch. Tow. Nauk. Lwow, 1:351, a *nomen nudum*.

RANGE.—Bering Sea, south along Alaska: Pribilof Islands and Bristol Bay (J. A. Allen, 1880:176); east to Franklin: Banks Island (Anderson, 1947:82), and Mackenzie: Dolphin and Union Strait (*ibid.*).

Odobenus rosmarus rosmarus (Linnaeus)

1758. [*Phoca*] *rosmarus* Linnaeus, Syst. nat., ed. 10, 1:38. Type locality, Arctic regions.
1859. *O*[*dobaenus*]. *rosmarus* Sunderall, Over. k. Vet. Acad. Forh., Stockholm, p. 446.

RANGE:—Atlantic and Arctic coasts south to Gulf of Maine (G. M. Allen, 1930:139); west to Barrow Strait and Somerset Island (Anderson, 1947:81); east to Greenland and Eurasia.

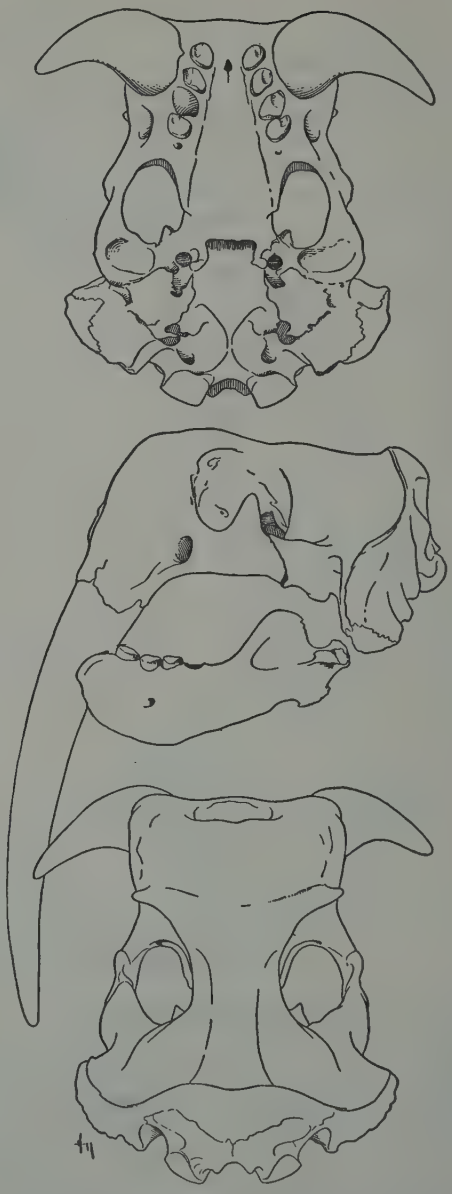


Fig. 516. *Odobenus rosmarus rosmarus*, Ingelfield Gulf, North Greenland, No. ? 2654 K.U., ♂ X ¼.

FAMILY PHOCIDAE—Earless Seals

Hind limbs not capable of rotating forward; manus and pes hairy; nails frequently well devel-

oped; front limbs noticeably smaller than hind limbs; neck short; pinnae absent; postorbital processes rudimentary or absent; mastoid processes swollen, continuous with auditory bullae; alisphenoid canal absent; scapula small, trochanter minor of femur rudimentary; ilium short, broad, abruptly turned outward and recurved anteriorly; acetabulum opposite first sacral vertebra; testes abdominal.

KEY TO NORTH AMERICAN GENERA OF PHOCIDAE

1. Single incisor in each lower jaw; premaxillae not meeting nasals; males having inflatable pouch of skin on nose or having elongate, inflatable tubular proboscis.
   2. Auditory bullae concave on anterior border; males having elongate inflatable tubular proboscis; nails small, rudimentary on pes. . . . . *Mirounga*, p. 987
   2′. Auditory bullae straight on anterior border; males having inflatable pouch of skin on nose; nails well developed on all digits. . . . . *Cystophora*, p. 986
1′. Two incisors in each lower jaw; premaxillae meeting nasals; males lacking inflatable pouch of skin on nose or elongate, inflatable tubular proboscis.
   3. Incisors $\frac{2}{2}$; nails rudimentary, frequently absent on pes. . . . . *Monachus*, p. 984
   3′. Incisors $\frac{3}{2}$; all digits having well-developed nails.
      4. Snout long (distance between tip of nose and eye nearly twice distance between eye and auditory meatus); nasals, frontals and parietals forming straight line in lateral view. *Halichoerus*, p. 983
      4′. Snout short (distance between tip of nose and eye much less than twice distance between eye and auditory meatus); nasals, frontals and parietals forming convex outline in lateral view.
         5. First and second digits of manus longer than third; jugal bone long, narrow (depth of jugal less than half its length); mammae 2. *Phoca*, p. 979
         5′. Third digit of manus longer than first two; jugal bone short, deep (depth of jugal not less than half its length); mammae 4. *Erignathus*, p. 982

SUBFAMILY PHOCINAE

Incisors $\frac{3}{2}$; posterior 4 cheek-teeth double-rooted; digits with 5 well-developed nails; toes of hind feet subequal, first and fifth not greatly exceeding others in length; premaxillae prolonged posterodorsally, meeting nasals.

Genus Phoca Linnaeus—Hair Seals

Revised by Doutt, Ann. Carnegie Mus., 29:61–125, illustrated, May 12, 1942.

1758. *Phoca* Linnaeus, Syst. nat., ed. 10, 1:37. Type, *Phoca vitulina* Linnaeus.

Total length, 5–7 ft.; weight to 800 lbs. Wooly underfur absent in adults; color highly variable; forefeet and hind feet well developed; first and second digits of manus longer than third. Condylobasal length, 154.9–221.1; least interorbital breadth, 4.5–20.0; facial portion of skull narrow, elongated, its dorsal outline gradually declining anteriorly in lateral view; supraorbital processes well developed; jugal bone long, narrow (depth at jugal less than half its length); posterior margin of mandibular ramus projecting posteriorly to form angle between articular and angular processes; cheek-teeth usually multi-lobed; acromion process of scapula present; mammae 2. Dentition, i. $\frac{3}{2}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{1}{1}$.

KEY TO NORTH AMERICAN SPECIES OF PHOCA

1. Posterior margin of palate broadly U-shaped; bony nasal septum reaching, or nearly reaching, posterior margin of palate.
   2. Cheek-teeth usually lacking accessory cusps; yellowish bands around neck, forelimbs and rump. . . . . *P. fasciata*, p. 980
   2′. Cheek-teeth having accessory cusps, yellowish bands absent. . *P. groenlandica*, p. 982
1′. Posterior margin of palate V-shaped; bony nasal septum not reaching posterior margin of palate.
   3. Cheek-teeth large, length P2 6.8 or more; color usually of dark spots on paler background. . . . . *P. vitulina*, p. 980
   3′. Cheek-teeth small, length of P2 less than 6.8; color usually of whitish spots with dark centers. . . . . *P. hispida*, p. 981

Subgenus Phoca Linnaeus

1758. *Phoca* Linnaeus, Syst. nat., ed. 10, 1:37. Type, *Phoca vitulina* Linnaeus.
1826. *Calocephalus* F. Cuvier, Dict. Sci. Nat., 39:544. Type, *Phoca vitulina* Linnaeus.
1864. *Halicyon* Gray, Proc. Zool. Soc. London, p. 28, July. Type, *Halicyon richardii* Gray.
1864. *Haliphilus* Gray, Ann. Mag. Nat. Hist., ser. 3, 17:446, June. Type, *Halichoerus antarctius* Peale [= *Halicyon richardii* Gray].

Phoca vitulina
Harbor Seal

Total length of males, 5–6 ft., females smaller; weight to approximately 300 lbs. Color highly variable, usually yellowish-gray dorsally varied with irregular spots of dark brown or black, yellowish-white ventrally, usually with small dark brown spots; sometimes uniform brownish-yellow or grayish dorsally, paler ventrally, lacking spots (after J. A. Allen, 1880:562–565). Total length of skull, 157.3–221.5; mastoid breadth, 100.0–128.0; least interorbital breadth, 9.5–16.0; nasals broad, tapering gradually to level of maxillo-frontal suture and then tapering abruptly; posterior margin of palate V-shaped; bony nasal septum reaching posterior margin of palate; cheek-teeth large, frequently set obliquely in jaw, third upper cheek-tooth usually the largest; posterior palatine foramina situated anterior to maxillo-palatine suture; mandible heavy and deep; mandibular symphysis short.

Harbor seals occur in coastal waters, frequenting harbors and bays. They may form loosely organized colonies but do not form harems. Mating takes place in the water, usually in September, and pups are born the following spring or summer after a gestation period of approximately nine and one-half months. Food consists of a variety of fishes and mollusks.

Phoca vitulina concolor De Kay

1842. *Phoca concolor* De Kay, Zoology of New York . . . , 1(pt. 1, Mammalia):53, type from Long Island Sound, near Sands Point, Nassau Co., New York.
1913. *Phoca vitulina concolor*, Brown, Pocket list of mammals of eastern Massachusetts, p. 30.

RANGE (Anderson, 1947:78).—Atlantic Coast from Franklin: Ellesmere Island, thence southward to North Carolina, rarely westward to Lake Ontario.

Phoca vitulina geronimensis J. A. Allen

1902. *Phoca richardii geronimensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:495, December 12, type from San Geronimo Island, Baja California.
1942. *Phoca vitulina geronimensis*, Doutt, Ann. Carnegie Mus., 29:116, 117, May 12.

RANGE.—Pacific Coast from California: Point Mugu, Ventura Co. (G. M. Lyon, 1935:151), thence southward to type locality.

Phoca vitulina mellonae Doutt

1942. *Phoca vitulina mellonae* Doutt, Ann. Carnegie Mus., 29:111, May 12, type from Lower Seal Lake, Quebec, approx. 90 mi. E Richmond Gulf, Hudson Bay, lat. 56° 30′ N, long. 74° 30′ W.

RANGE (Anderson, 1947:78).—Known only from Quebec: Upper Seal Lake; type locality.

Phoca vitulina richardii (Gray)

1864. *Halicyon richardii* Gray, Proc. Zool. Soc. London, p. 28, July, type from Vancouver Island, British Columbia. (Ognev, The mammals of USSR . . . , 3:524, 1935, regards *richardii* as subspecifically inseparable from the earlier named *Phoca largha* of Pallas, Zoographia Rosso-Asiatica . . . , 1:113, 1811.)
1942. *Phoca vitulina richardii*, Doutt, Ann. Carnegie Mus., 29:112, May 12.
1902. *Phoca richardii pribilofensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:495, December 12, type from St. Paul Island, Pribilof Islands, Alaska. (Regarded by Schwarz, Jour. Mamm., 23:222, May 14, 1942, as identical with the *Phoca largha* of Pallas, Zoographia Rosso-Asiatica . . . , 1:113, 1811.)

RANGE.—Arctic and Pacific coasts from Yukon: Herschel Island (Anderson, 1947:78), thence westward and southward along coast to California: Monterey County (Doutt, 1942:121).

Subgenus Histriophoca Gill

1873. *Histriophoca* Gill, Amer. Nat., 7:179, March. Type, *Phoca fasciata* Zimmermann.

Phoca fasciata Zimmermann
Ribbon Seal

1783. *Phoca fasciata* Zimmermann, Geographische Geschichte . . . , 3:277. Type locality, Kurile Islands, Japan.
1811. *Phoca equestris* Pallas, Zoographia Rosso-Asiatica . . . , 1:111, a renaming of *P. fasciata*.

Total length of males to 6 ft., females slightly smaller; weight of an adult male recorded as 209 lbs. Males dark brown with bands of yellowish encircling neck, rump and forelimbs; females grayish-yellow or grayish-brown with faint indication of yellowish bands, the one encircling rump most distinct. Total length of skull, 193.0–201.3; mastoid breadth, 122.0–133.4; least interorbital breadth, 9.8–14.6. Nasals narrow, tapering gradually from anterior to posterior; posterior margin of palate

broadly U-shaped; auditory bullae large; cheek-teeth small, usually lacking accessory cusps; posterior palatine foramina situated on, or posterior to, maxillo-palatine suture; mandible slender; mandibular symphysis long; masseteric fossa broad and deep; coronoid process large.

This species inhabits open marine waters, mainland and insular shores and sea ice. Ribbon seals occur singly or in small groups. The gestation period is believed to be approximately 9 months. Skins of these seals are highly prized by Eskimos who remove the skin entire. After it is tanned a long slit in the abdomen is provided with eyelet holes and lacing string to make a waterproof bag.

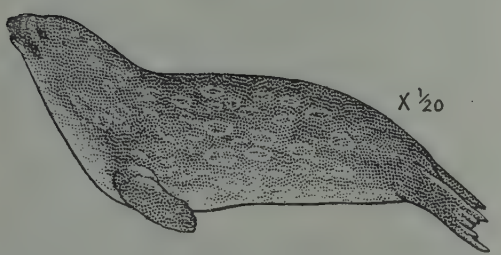
RANGE.—Alaska: Port Barrow (Bee and Hall, 1956:226), thence southward to Aleutian Islands (Doutt, 1942:94).

Subgenus **Pusa** Scopoli

1777. *Pusa* Scopoli, Introductio ad historiam naturalem . . . , p. 490. Type, *Phoca foetida* Fabricius [= *Phoca hispida* Schreber].

1864. *Pagomys* Gray, Proc. Zool. Soc. London, p. 31, July. Type, *Phoca foetida* Fabricius [= *Phoca hispida* Schreber].

Phoca hispida
Ringed Seal



Total length to approximately 6½ ft., weight to approximately 200 lbs. Color highly variable, resembling *P. vitulina*; generally white, silvery-white or yellowish-white ventrally; spotted, streaked or marbled with black dorsally, often having white spots with dark centers; hairs around lips, and often on head, axillae, ventral surface of tail and hind limbs, tawny or russet; pelage coarse and stiff, usually directed backwards. Total length of skull, 155.5–177.0; mastoid breadth, 90.4–105.8; least interorbital breadth, 4.0–6.2. Nasals tapering as in *P. vitulina*; posterior margin of palate V-shaped; bony nasal septum not reaching posterior margin of palate; cheek-teeth small, third the largest both above and below; posterior palatine foramina situated on, or posterior to, maxillo-palatine suture; mandible slender; mandibular symphysis long; masseteric fossa narrow; coronoid process small.

Ringed seals inhabit open marine waters and pack ice. In winter they congregate in sheltered bays and inlets. A single pup is born from February to April after a gestation period of approximately 272 days. The pup is born in a cavity in the snow. The cavity opens through the ice below and is often not visible from the surface of the snow. Food is mainly marine invertebrates.

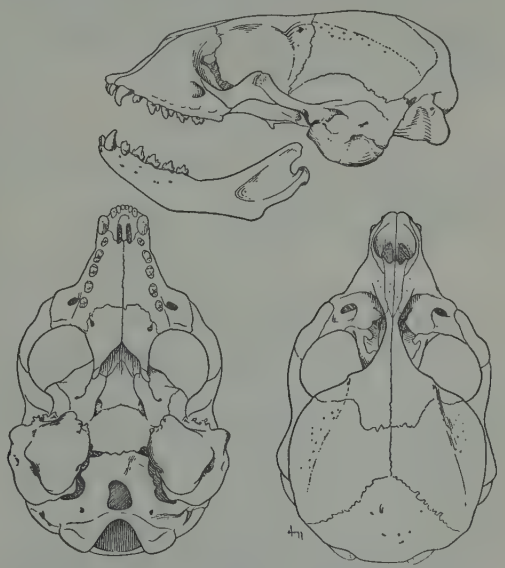


Fig. 517. *Phoca hispida hispida*, Holstenberg, Greenland, No. 2827 K.U., sex ?, X ⅓.

Phoca hispida beaufortiana Anderson

1943. *Phoca hispida beaufortiana* Anderson, Ann. Rep. Provancher Soc. Nat. Hist., Quebec, p. 25 (for 1942), September 7, type from Cockburn Point, Dolphin and Union Strait, Mackenzie; lat. 68° 55′ 29″ N, long. about 115° 10′ W.

RANGE.—Arctic seas from Alaska: Wainwright (Bee and Hall, 1956:227), thence eastward to Mackenzie: Coronation Gulf (Anderson, 1947:79).

Phoca hispida hispida Schreber

1775. *Phoca hispida* Schreber, Die Säugthiere . . . , Theil 3, Heft 13, pl. 86. Type locality, coasts of Greenland and Labrador.

1776. *Phoca foetida* Fabricius, *in* Müller, Zoologiae Danicae prodromous . . . , p. viii. Type locality, Greenland (see Fabricius, Fauna Groenlandica, p. 13, 1780).

1820. *Phoca annellata* Nilsson, Skandinavisk Fauna . . . , 1:365, a renaming of *Phoca foetida* Fabricius.

1921. *Pusa hispida pygmaea* Zukowsky, Arch. Naturgesch., 10(87A):183. Type locality, Greenland or Novaya Zemlya, Russia.

RANGE (Anderson, 1947:79).—"Mostly in Arctic seas, recorded as far north as 82° 40′; in all parts of the sea in

Eastern American Arctic from Greenland south to Labrador and Hudson Bay; probably intergrading with *P. h. beaufortiana* in central part of Canadian Arctic Archipelago."

Phoca hispida soperi Anderson

1943. *Phoca hispida soperi* Anderson, Ann. Rept. Provancher Soc. Nat. Hist., Quebec, p. 27 (for 1942), September 7, type from near mouth of Takuirbing River, eastern end Nettilling Lake, about 85 ft., Baffin Island, Franklin; lat. 66° 16′ N, long. 74° 33′ 36″ W.

RANGE (Anderson, 1947:79).—Known only from Franklin: Nettilling Lake and E side Foxe Basin near mouth of Koukdjuak River, Baffin Island.

Subgenus Pagophilus Gray

1844. *Pagophilus* Gray, *in* The zoology of the voyage of H.M.S. Erebus and Terror . . . , 1(Mamm.):3. Type, *Phoca groenlandica* Erxleben.
1904. *Pagophoca* Trouessart, Catalogus mammalium . . . , Suppl., p. 287, a renaming of *Pagophilus* Gray.

Phoca groenlandica Erxleben
Harp Seal

1777. [*Phoca*] *groenlandica* Erxleben, Systema regni animalis . . . , 1:588. Type locality, Greenland or Newfoundland.
1785. *Phoca semilunaris* Boddaert, Elenchus animalium, p. 170. Type locality, Greenland or Iceland.
1822. *Phoca albicauda* Desmarest, Mammalogie . . . , *in* Encyclopédie méthodique . . . , p. 541, a *nomen dubium*. Type locality, unknown.
1824. *Phoca leucopla* Thienemann, Nat. Bemerk. Reise Europe, 1:102, pl. 13. Type locality, "A few miles north of Grimsey Island, north of Iceland." (Ellerman and Morrison-Scott, Checklist of Palaearctic and Indian mammals, 1758 to 1946. British Mus., London, p. 331, November 19, 1951.)
1851. *Phoca albini* Alessandrini, Mem. R. R. Accad. Bologna, 2:158. Type locality, unknown.

Total length of males, 5–6 ft., females usually smaller; weight to approximately 400 lbs. although some old males have been recorded as reaching 800 lbs. Males whitish to yellowish-white dorsally, face and head blackish; black elliptical band on side from shoulder nearly to tail, bands from each side meeting broadly at shoulder, barely meeting near tail; hind limbs generally irregularly spotted with black. Females similar in color to males but black markings absent, or if present irregular and indistinct. Total length of skull, 190.9–221.0; mastoid breadth, 114.6–123.6; least interorbital breadth, 8.3–20.0. Nasals long, narrow, tapering gradually from anterior to posterior; posterior margin of palate broadly U-shaped; cheek-teeth small, having accessory cusps; third cheek-tooth the largest both above and below; posterior palatine foramina on, or posterior to, maxillo-palatine suture; mandible as in *P. fasciata*.

Female harp seals give birth to a single pup (rarely twins) on ice floes in February or March. Pups, which weigh 12–15 lbs. at birth, are abandoned by females at the age of 2 weeks. This species is migratory, moving southward in winter ahead of the closing ice and northward in spring after the pups leave the ice floes. Adults eat fishes and crustaceans; pups feed mainly on crustaceans.

RANGE.—North Atlantic Ocean and adjoining waters of Arctic Ocean, west to Mackenzie: Aklavik, Mackenzie River Delta (Anderson, 1947:79), and south occasionally as far as New Jersey: Trenton, Delaware River (Rhoads, 1903:126).

Genus Erignathus Gill—Bearded Seals

1866. *Erignathus* Gill, Comm. Essex Inst., 5:5, 9, April 7. Type, *Phoca barbata* Erxleben.

Total length of males, 8–12 ft., weight to 1000 lbs.; total length of females, 7½–8 ft., weight to approximately 500 lbs. Body grayish to yellowish, darker grayish on back; muzzle broad, having vibrissae dense and straight; forehead high, convex; third digit of manus longest. Condylobasal length, (♂) 227–257, (♀) 208–238; zygomatic breadth, (♂) 134–138, (♀) 128–137; length of upper series of cheek-teeth, (♂) 83–85, (♀) 72–81. Skull having small postorbital processes; palatal area broad, oval; posterior border of palate emarginate, not triangular; jugal short, deep (depth of jugal not less than half its length); incomplete narial septum; posterior margin of mandibular ramus forming a straight line between angular process and articular process; scapula lacking acromion process; upper border of ilium lacking abrupt eversion; mammae 4. Dentition, i. $\frac{3}{2}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{1}{1}$.

The bearded seal, a non-migratory species, is found in open waters off the coasts, or in large bays and fiords. Breeding in June or July is followed by an 11-month gestation period. The female bears a single young on an ice floe in April or May. The bearded seal is a bottom feeder, eating shrimp, crabs, clams, snails, octopuses, sea cucumbers, and bottom fish such as sculpin and flounder. The genus is monotypic.

Erignathus barbatus
Bearded Seal

See characters of the genus.

Fig. 518. *Erignathus barbatus barbatus*, Holstenberg, Greenland, No. 2881 K.U., sex ?, X ⅛.

Erignathus barbatus barbatus (Erxleben)

1777. [*Phoca*] *barbata* Erxleben, Systema regni animalis . . . , 1:590. Type locality, coasts of Scotland, or southern Greenland or Iceland.
1866. *Erignathus barbatus*, Gill, Comm. Essex Inst., 5(1): 12, April 7.
1776. *Phoco barbata* Fabricius, *in* Müller, Zoologiae Danicae prodromous . . . , p. viii, a *nomen nudum*.
1778. *Phoca leporina* Lepechin, Acta. Ac. Petrop., 1:264, pl. 8. Type locality, White Sea.
1828. *Phoca parsonii* Lesson, Dict. Class. Hist. Nat., 13:414. Type locality, Northern seas.
1828. *Phoca lepechenii* Lesson, Dict. Class. Hist. Nat., 13: 415, a renaming of *Phoca leporina* Lepechin.

RANGE.—Canada: Hudson Bay, east to Greenland: Davis Strait, thence southward to Newfoundland (Anderson 1947: 80).

Erignathus barbatus nauticus (Pallas)

1811. *Phoca nautica* Pallas, Zoographia Rosso-Asiatica . . . , 1:108. Type locality, Okhotsk Sea. (North American specimens regarded by Anderson, Canadian Field-Nat., 44:99, April 1, 1930, as identical with *E. b. barbatus*.)
1904. *Erignathus barbatus nauticus*, Osgood, N. Amer. Fauna, 24:47, November 23.
1811. *Phoca albigena* Pallas, Zoographia Rosso-Asiatica . . . , 1:109. Type locality, Kamchatka.

RANGE.—Alaska: Point Barrow (Bee and Hall, 1956: 228), thence southward along coast of Alaska to Bristol Bay (Osgood, 1904:47).

Genus **Halichoerus** Nilsson—Gray Seal

1820. *Halichoerus* Nilsson, Skandinavisk fauna . . . , 1:376. Type, *Halichoerus griseus* Nilsson [= *Phoca grypus* Fabricius].

Total length of males to 12 ft., weight to 800 lbs.; total length of females, 5½–6½ ft., weight to 700 lbs. Color of body varying from silverish to dusky-gray, obscure black spots dorsally and laterally. Snout long (distance between tip of nose to eyes nearly twice that between eye and auditory meatus); muzzle broad, vibrissae crenulated. Total length of skull, 208–320; zygomatic breadth, 120–198; length of upper series of cheek-teeth, 73. Skull arched dorsally, profile of parietals, frontals, and nasals form straight line; cheek-teeth single-rooted, excepting two posteriormost teeth in upper jaw and single posteriormost tooth in lower jaw. Dentition, i. $\frac{3}{2}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{1}{1}$

Gray seals are gregarious preferring waters about cliffs, rocks, and reefs. In winter they migrate into estuaries and inlets. Females give birth to a single white pup (rarely twins) in January or February on sandbars, ledges, or ice. The pup is suckled from 2 to 3 weeks, and breeding takes place approximately 3 weeks after the birth of the young. Food of adults consists of slower swimming fish, whereas the young eat mollusks and crustaceans. The gray seal is of little economic importance. This genus is monotypic.

Halichoerus grypus (Fabricius)
Gray Seal

1791. *Phoca grypus* Fabricius, Skrivter af Naturh.-Selskabet, Kjøbenhavn, 1(2):167, pl. 13, fig. 4. Type locality, Greenland.
1841. *Halichoerus grypus*, Nilsson, Arch. Naturgesch., Jahrg. 7, 1:318.
1820. *Halichoerus griseus* Nilsson, Skandinavisk fauna . . . , 1:377. Type locality, Greenland.
1824. *Phoca halichoerus* Thienemann, Nat. Bermerk. Reise Europe, 1:142. Type locality, Norway.

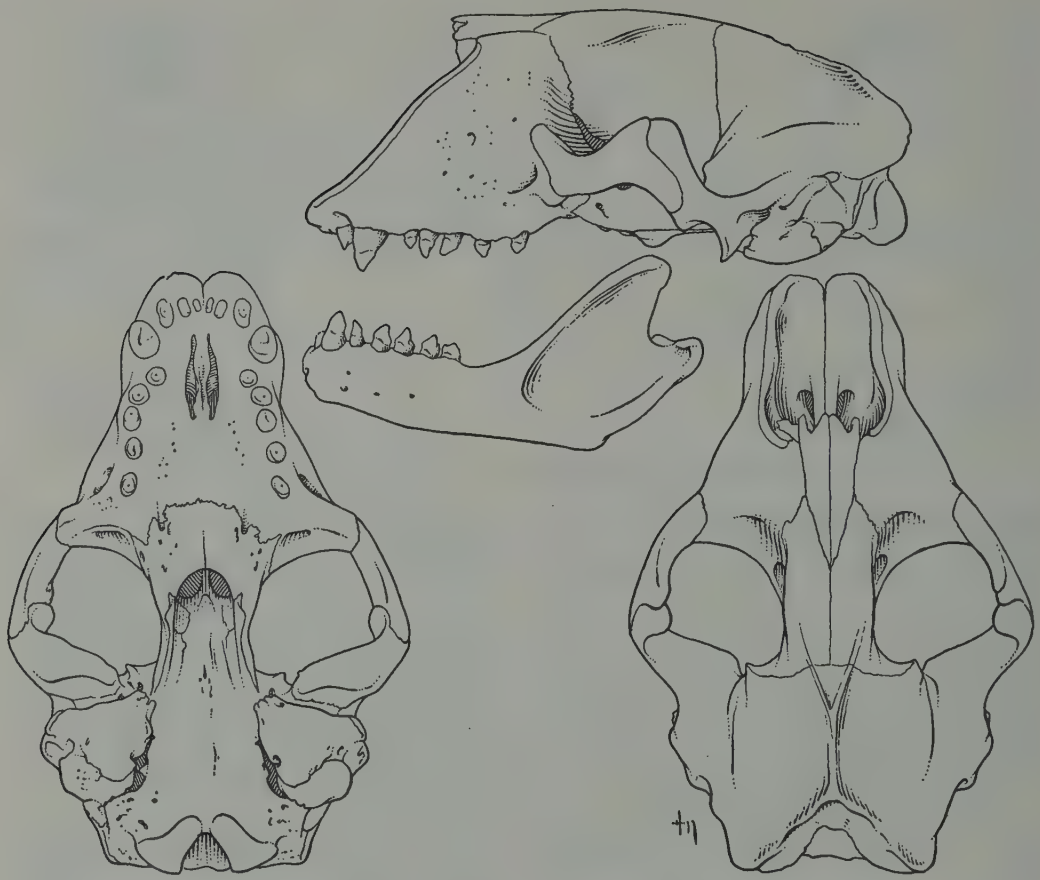


Fig. 519. *Halichoerus grypus*, SW Point Anticosti, Quebec, No. 35291 U.S.N.M., ♂, X ⅛.

1851. *Halichoerus macrorhynchus* Hornschuch and Schilling, Arch. Naturgesch., 17, 2:28. Type locality, Baltic Sea.
1851. *Halichoerus pachyrhynchus* Hornschuch and Schilling, Arch. Naturgesch., 17, 2:28. Type locality, Baltic Sea.
1886. *Halichoerus grypus* var. *atlantica* Nehring, Sitzungsber., Gesell. Naturforsch. Freunde, Berlin, p. 122. Type locality, west coast of Norway.
1886. *Halichoerus grypus* var. *baltica* Nehring. Sitzungsber., Gesell. Naturforsch. Freunde, Berlin, p. 122. Type locality, Baltic Sea.

See characters of the genus.

RANGE.—Greenland to Labrador (Anderson, 1947:80), thence southward to New Jersey (Goodwin, 1933:73).

SUBFAMILY MONACHINAE

Incisors $\frac{2}{2}$; posterior 4 cheek-teeth double-rooted; first and fifth toes of hind feet greatly exceeding others in length; nails rudimentary or absent; premaxillae prolonged posterodorsally, meeting nasals.

Genus Monachus Fleming—Tropical Seals

1822. *Monachus* Fleming, The Philosophy of zoology . . . , 2:187. Type, *Phoca monachus* Hermann.
1824. *Pelagios* F. Cuvier, Mem. Mus. Hist. Nat., 11:196, pl. 2. Type, *Phoca monachus* Hermann.
1826. *Pelagius* F. Cuvier, Dict. Sci. Nat., 39:550, an emendation of *Pelagios* F. Cuvier, 1824.
1841. *Pelagocyon* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, 1:xxxiv, 163. Type, *Phoca monachus* Hermann.
1848. *Rigoon* Gistel, Naturg. Thierreichs f. höhere Schulen, p. x, a renaming of *Pelagios* F. Cuvier, 1824.
1854. *Heliophoca* Gray, Ann. Mag. Nat. Hist., ser. 2, 13:201. Type, *Heliophoca atlantica* Gray [= *Phoca monachus* Hermann].

Total length of males, to 7½ ft. Dorsal surface of body brownish-gray without spots, white or yellowish-gray ventrally; muzzle broad, and slightly grooved between nostrils; vibrissae short, not dense; nails well developed on forefeet and rudimentary on hind feet; digits of hind feet becoming shorter proximally; underfur sparse or absent. Condylobasal length (♂ subadult, 100369 USNM, from Campeche), 275, (♀ adult, 102524 USNM, from Campeche), 282; zygomatic breadth, (♂) 183, (♀) 172; interorbital constriction, (♂) 33.4, (♀) 28.3. Rostrum elongate and depressed; palate angularly notched posteriorly; canines large, conical; cheek-teeth conical, hollow, having strongly lobed cingulum on proximal side; cheek-teeth obliquely placed in respect to median palatine line, all double-rooted except anteriormost two, in both jaws, which are single rooted; molars having slightly developed accessory cusps anteriorly and posteriorly. Dentition, i. $\frac{2}{2}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{1}{1}$.

Monachus tropicalis (Gray)
West Indian Seal

1850. *Phoca tropicalis* Gray, Catalogue of the . . . Mammalia in the . . . British Museum, 2:28. Type locality, Jamaica.

1866. *Monachus tropicalis*, Gray, Catalogue of the seals and whales in the British Museum, p. 20.

Of the 2 recognized species of the genus *Monachus*, *M. tropicalis* differs from *M. monachus* of the Old World in slightly smaller size. For other features of *M. tropicalis* see characters of the genus.

The West Indian Seal basks in the sunshine in groups, includes fish and mollusks in its diet, and is

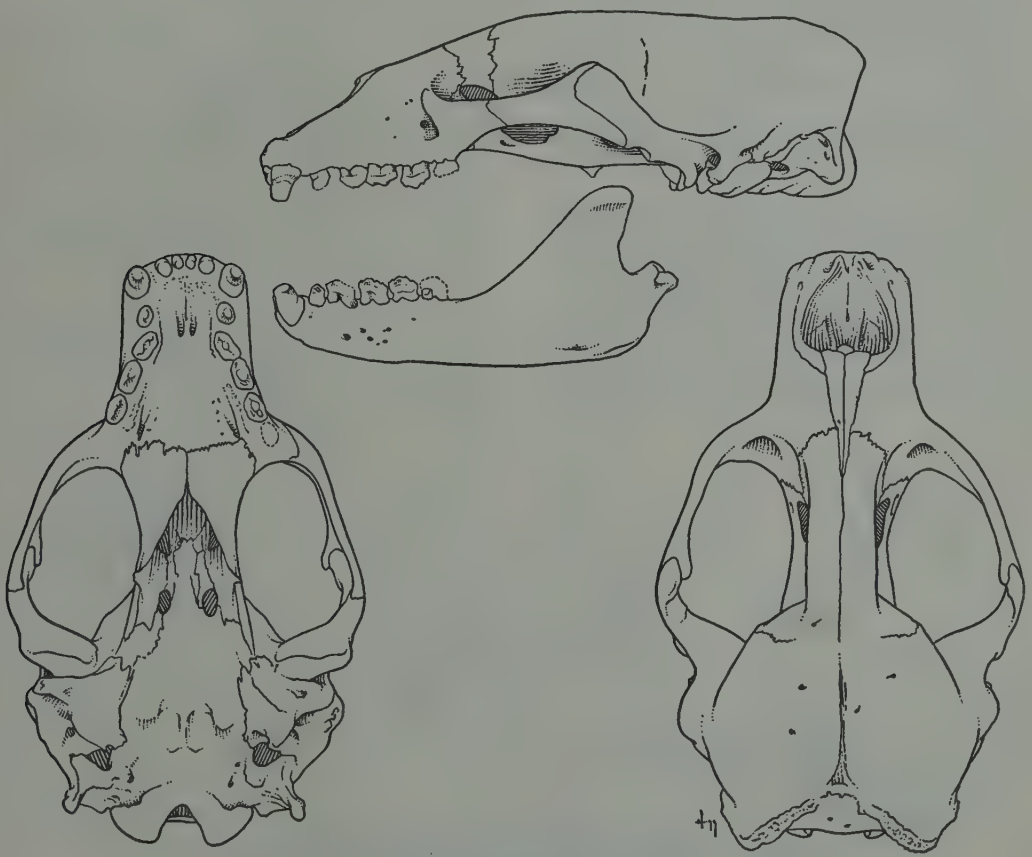


Fig. 520. *Monachus tropicalis*, Yucatán, No. 10421 A.M., sex ?, X ¼.

now rare, having been extirpated in much of its former range.

RANGE.—Bahama Islands, thence southwestward in Gulf of Mexico to Honduras (G. M. Allen, 1942a:453).

SUBFAMILY CYSTOPHORINAE

Incisors $\frac{2}{1}$, cheek-teeth single-rooted, except fifth upper and occasionally fourth upper, which are double-rooted; males having an inflatable pouch of skin on nose or having an elongate, inflatable tubular proboscis; toes of hind feet subequal or having first and fifth toes much longer than others; nails well developed (*Cystophora*), or rudimentary (*Mirounga*); premaxillae not meeting nasals.

Genus Cystophora Nilsson—Hooded Seal

1820. *Cystophora* Nilsson, Skandinavisk fauna . . . , 1:382. Type, *Cystophora borealis* Nilsson [= *Phoca cristata* Erxleben].

1826. *Stemmatopus* F. Cuvier, Dict. Sci. Nat., 39:550. Type, *Stemmatopus cristatus* Cuvier [= *Phoca cristata* Erxleben].

1911. *Cystophoca* Brass, Aus dem Reiche der Pelze, p. 668, April, a renaming, perhaps accidental, of *Cystophora* Nilsson, 1820.

Total length of males to 10½ ft., weight to 850 lbs., total length of females to 8 ft., weight to 400 lbs. Color slate grayish to blackish above, sides paler spotted with white. Males have bladderlike protuberance on nose, inflatable in times of danger, or anger; hind feet slightly emarginate on distal borders having distalmost digit of pes slightly longer than medial digits; digits of forefeet and hind feet with large claws. Condylobasal length, (♂) 264–275, (♀) 220; zygomatic breadth, (♂) 210–220, (♀) 165; length of series of upper cheek-teeth, (♂) 90–91, (♀) 74. Skull having palatines slightly emarginate on posterior border; auditory bullae square in front; basisphenoid and basioccipital bones form broad, flat, not concave, interbullar space; superior notch of mandible deeply U-shaped. Dentition, i. $\frac{2}{1}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{1}{1}$.

Hooded seals are gregarious occurring at times on the periphery of herds of the harp seal (*Phoca groenlandica*). The hooded seal migrates in autumn from the east coast of Greenland and Baffin Bay to as far south as Sable Island Bank, Nova Scotia, returning north in spring. A single pup (25–30 lbs.) is born in late February or early March on ice floes. Breeding takes place 3 to 4 weeks after parturition. Food consists, so far as known, largely of fish. This genus is monotypic.

Cystophora cristata (Erxleben)
Hooded Seal

1777. [*Phoca*] *cristata* Erxleben, Systema regni animalis . . . , 1:590. Type locality, Southern Greenland or Newfoundland.

1841. *Cystophora cristata*, Nilsson, Arch. Naturgesch., Jahrg. 7, 1:326.

1820. *Cystophora borealis* Nilsson, Skandinavisk fauna . . . , 1:383. Type locality, Southern Greenland or Newfoundland.

See characters of the genus.

RANGE.—Franklin: Cape Sabine, Ellesmere Island (Anderson, 1947:80), thence southward to Florida: Cape Canaveral, Brevard Co. (Miller, 1917:121).

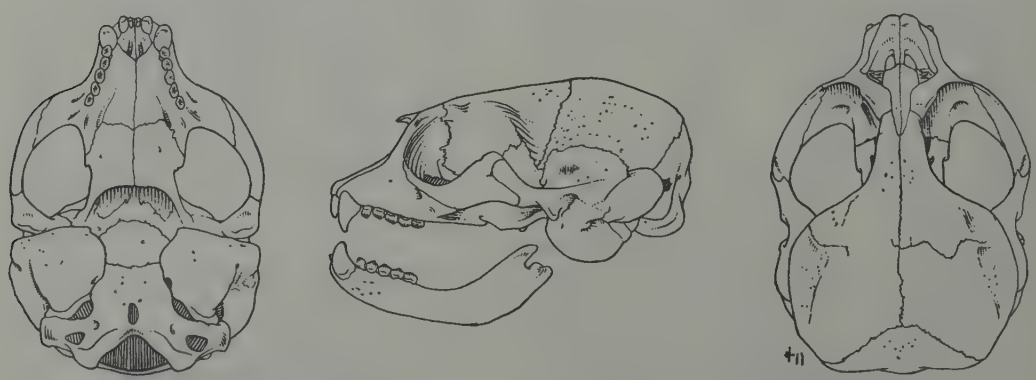


Fig. 521. *Cystophora cristata*, origin unknown [obtained from Swope Park Zoo, Kansas City, Missouri], No. 11094 K.U., sex ?, X ⅛.

Genus Mirounga Gray—Elephant Seal

1827. *Mirounga* Gray, *in* Griffith, The animal kingdom . . . by the Baron Cuvier . . . , 5:179. Type, *Phoca proboscidea* Péron [= *Phoca leonina* Linnaeus].

1826. *Macrorhinus* F. Cuvier, Dict. Sci. Nat., 39:552. Type, *Phoca proboscidea* Péron [= *Phoca leonina* Linnaeus]. Not *Macrorhinus* Latreille, 1825, a coleopteran.

1830. *Rhinophoca* Wagler, Natürliches System der Amphi-

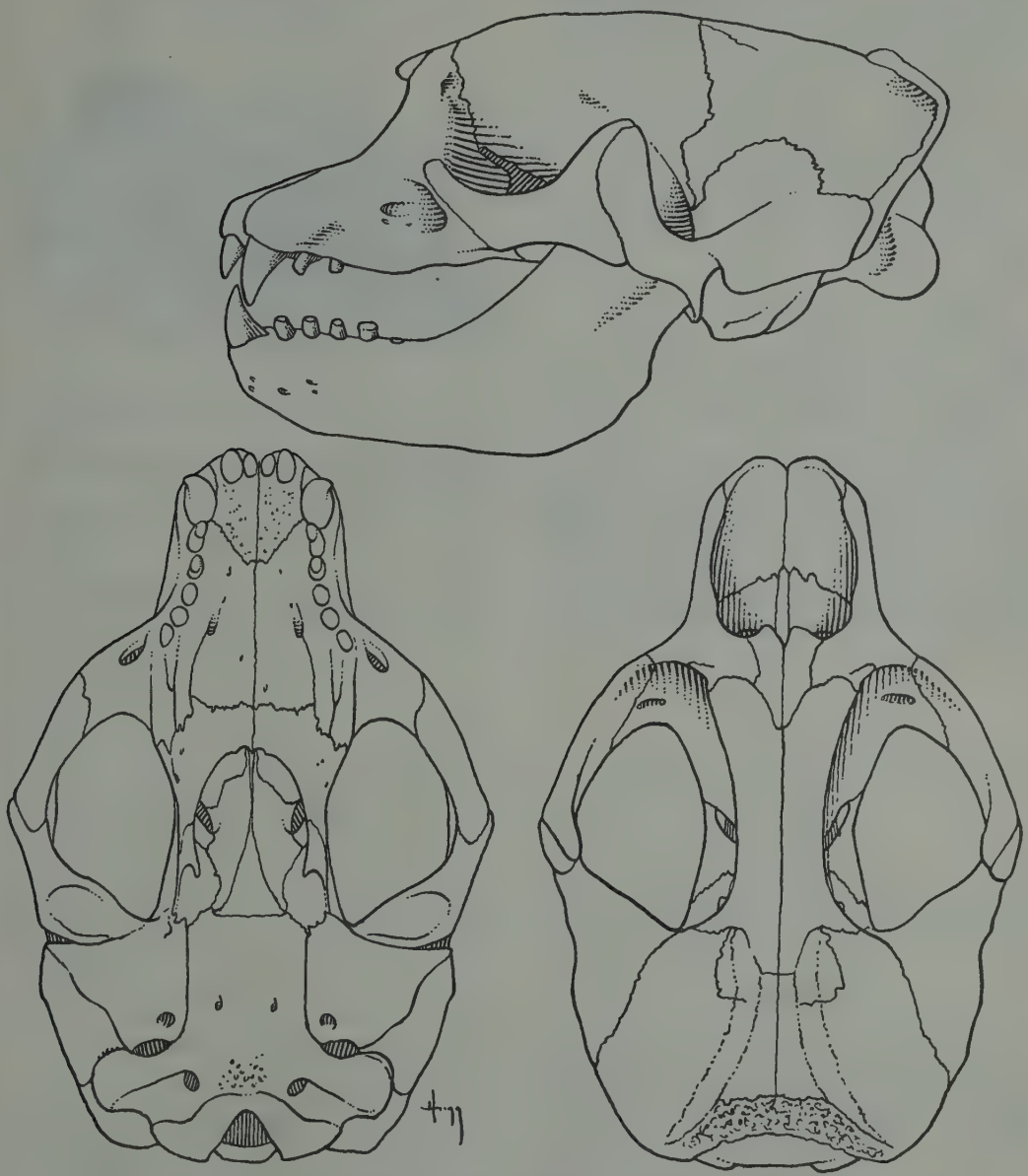


Fig. 522. *Mirounga angustirostris*, St. Bartholomew's Bay, Baja California, No. 4704 U.S.N.M., ♀, (after J. A. Allen, Miscl. Publ. No. 12, U.S. Geol. and Geogr. Surv., figs., 57–59, pp. 744–746, 1880), X ⅛.

bien . . . , p. 27. Type, *Phoca proboscidea* Péron [= *Phoca leonina* Linnaeus].

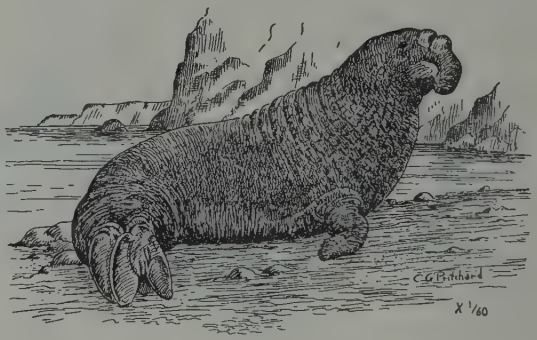
1841. *Physorhinus* Gloger, Gemeinnütziges Hand- und Hilfsbuch Naturgeschichte, 1:xxxiv, 163. Type, the Mirounga [= *Phoca leonina* Linnaeus] of the southern seas. Not *Physorhinus* Eschscholtz, 1836, a genus of Coleoptera.

1843. *Morunga* Gray, List of the . . . Mammalia in the . . . British Museum, p. xxiii, 103, May 13, an accidental renaming of *Mirounga* Gray, 1827.

Total length of males, 15–16 ft., weight to 5000 lbs., total length of females to 11 ft., weight to approximately 1700 lbs. Color of body dull yellowish-brown mixed with gray, darker on back, yellowish on venter; immature individuals grayish; males have a proboscislike inflatable snout; hind feet bilobed; claws, if present, rudimentary. Condylobasal length, (♂) 480–510, (♀) 320; zygomatic breadth, (♂) 360–365, (♀) 200; length of series of upper cheek-teeth, (♂) 130–140, (♀) 98. Palatine bones deeply emarginate on posterior border; auditory bullae concave anteriorly; interbullar space narrow and deeply hollowed; superior notch of mandible not deeply emarginate. Dentition, i. $\frac{2}{1}$, c. $\frac{1}{1}$, p. $\frac{4}{4}$, m. $\frac{1}{1}$.

Elephant seals seem to be solitary when at sea, but are gregarious on beaches. One of the bulls maintains a dominant position over several females and one bull in seven accomplishes most of the mating, which is in the period of December to March. After a gestation period of approximately 11½ months the cow, which may be accompanied by a yearling, gives birth to a single, blackish pup. Elephant seals eat small sharks, ratfish, squids and rays; these seals probably feed in deep water.

Mirounga angustirostris (Gill)
Elephant Seal



1866. *Macrorhinus angustirostris* Gill, Comm. Essex Inst., 5(1):13, April 7, type from San Bartolomé Bay, Baja California.

1904. [*Mirounga*] *angustirostris*, Elliot, Field Columb. Mus., Publ. 95, Zool. Ser., 4:545, August 2.

See characters of the genus. The only other species, *M. leonina*, occurs in the Southern Hemisphere.

RANGE.—Alaska: Kasaan, Prince of Wales Island (Willett, 1943:500), thence southward to Baja California: Cape San Lázaro (Huey, 1927:160).

Order SIRENIA—Manatees, Dugongs and Sea Cow

Fusiform; entirely aquatic; no visible separation of head from body; eyes small, eyelids imperfectly developed; external auditory meatus small, pinnae absent; pectoral appendages paddle-shaped, digits not externally visible; carpal elements vary from 3 (Dugongidae) to 5–6 (Trichechidae); pelvic appendages absent; tail flattened and laterally expanded, rounded or forked posteriorly; skin tough and rugose, naked or sparsely haired; bones of skull and postcranial skeleton massive and dense; nasal bones absent (Dugongidae) or vestigial (Trichechidae); 6–8 cervical vertebrae; clavicles absent; sacrum absent; anterior caudal vertebrae having chevron bones; toothless or having incisors (I2 a tusk in Dugongidae) and molariform teeth that are separated by wide diastema; Recent genera having anterior portion of palate and corresponding portion of mandible covered with rough, horny plate; tongue small, fixed, rugose; single pair of pectoral mammae; stomach of several chambers.

Family TRICHECHIDAE—Manatees

Vestigial nails present on pectoral appendages; skin nearly hairless excepting bristles on snout; upper lip cleft, each half capable of moving independently of other; nostrils valvelike; rostrum short, formed dorsally by union of premaxillae anterior to external nares; rostrum only slightly convex ventrally; nasal bones present; incisors $\frac{2}{2}$, rudimentary, concealed beneath horny plate and lost before maturity; molariform teeth $\frac{1\,1}{1\,1}$, selenodont, rarely more than $\frac{6}{6}$ at any one time; anterior molariform teeth wear down and fall out, replaced at posterior end of tooth-row; 2 tuberculate, transverse ridges on molariform teeth; 6 cervical vertebrae; 5–6 carpal elements.

The family Trichechidae contains a single genus.

Genus Trichechus Linnaeus—Manatee

Revised by Hatt, Bull. Amer. Mus. Nat. Hist., 66:533–566, 1 pl., 2 figs., September 10, 1934; see also Simpson, Bull. Amer. Mus. Nat. Hist., 59:419–503, 23 figs., September 6, 1932.

1758. *Trichechus* Linnaeus, Syst. nat., ed. 10, 1:34. Type, *Trichechus manatus* Linnaeus.

1772. *Manatus* Brünnich, Zoologiae fundamenta . . . , pp. 34, 38. Type, *Trichechus manatus* Linnaeus.

1803. *Oxystomus* G. Fischer, Das Nat. Mus. Naturgesch. zu Paris, 2:353. Type, *Trichechus manatus* Linnaeus.

1848. *Halipaedisca* Gistel, Naturg. Thierreichs f. höhere Schulen, p. 83. Type, *Manatus americanus* Desmarest [= *Trichechus manatus* Linnaeus].

See characters of the family. There are two species in the genus other than the North American *T. manatus*. These are: *T. inunguis* of the rivers of northeastern South America and *T. senegalensis* of West Africa.

Trichechus manatus
Manatee

Total length to approximately 15 ft., usually 8–13. Weight to approximately 1500 lbs. Color dull grayish to blackish throughout. See characters of the family.

Manatees are found in sheltered marine bays and in sluggish rivers, usually in turbid water. They occur singly or in small groups, their presence frequently indicated by a series of upboilings in the water. Females give birth to a single calf at any time of the year after a gestation period of approximately 6 months. Calves are thought to remain with females for more than a year as females have been observed with young of two different ages. Food consists of aquatic vegetation.

Trichechus manatus latirostris (Harlan)

1823. *Manatus latirostris* Harlan, Jour. Acad. Nat. Sci. Philadelphia, 3(1):394. Type locality, near the capes of East Florida.

1934. *Trichechus manatus latirostris*, Hatt, Bull. Amer. Mus. Nat. Hist., 66:538, September 10.

RANGE (Miller and Kellogg, 1955:791).—Coast and coastal rivers of Southeastern United States from North Carolina: Beaufort, thence southward and westward to Texas: mouth of Rio Grande.

Trichechus manatus manatus Linnaeus

1758. [*Trichechus*] *manatus* Linnaeus, Syst. nat., ed. 10, 1:34. Type locality, restricted to West Indies by Thomas (Proc. Zool. Soc. London, p. 132, March 22, 1911).

1784. *Manati Trichechus* Boddaert, Elenchus animalium, 1:173. Type locality, restricted to West Indies by Hatt (Bull. Amer. Mus. Nat. Hist., 66:535, September 10, 1934).

1795. *Trichechus antillarum* Link, Beyträge zur Naturgeschichte, 1(2):109. Type locality, restricted to West Indies by Hatt (Bull. Amer. Mus. Nat. Hist., 66:535, September 10, 1934).

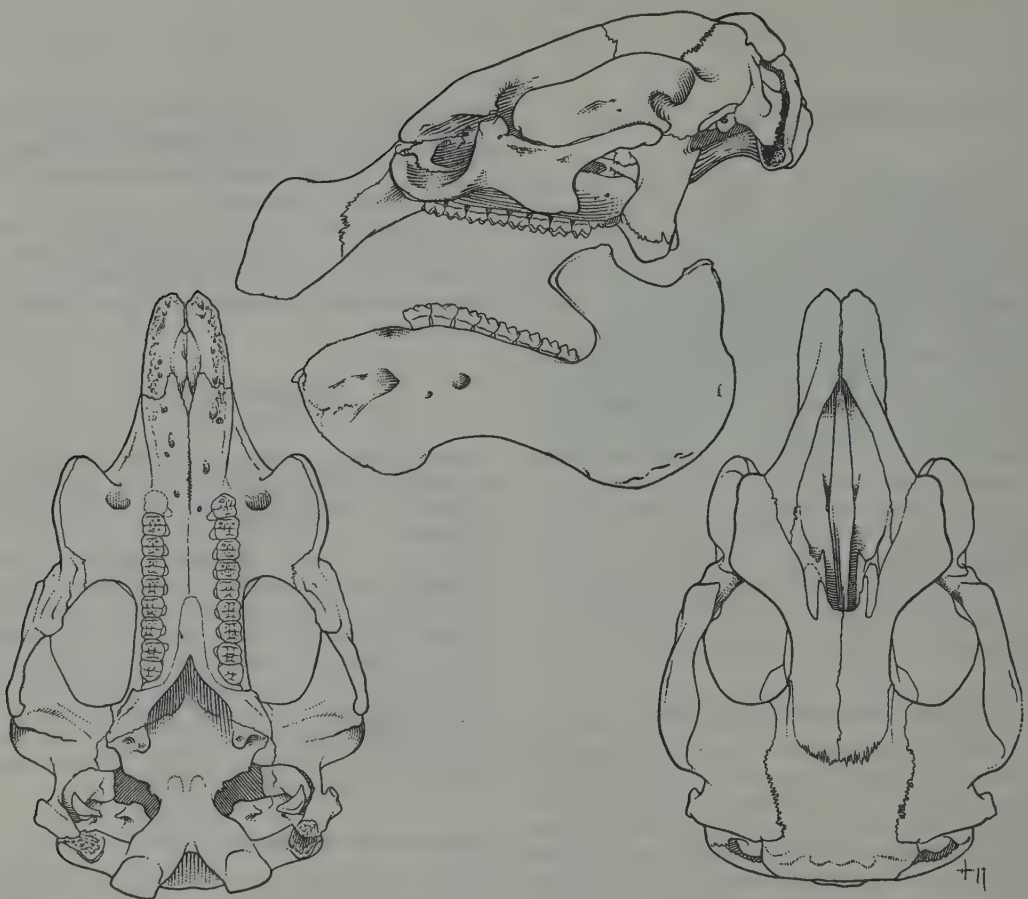


Fig. 523. *Trichechus manatus manatus,* Alvarado, Veracruz, No. 32229 K.U., sex ?, X ¼.

1795. *Trichechus americanus* Link, Beyträge zur Naturgeschichte, 1(2):109. Type locality, restricted to West Indies by Hatt (Bull. Amer. Mus. Nat. Hist., 66:535, September 10, 1934).

1800. *Manatus Guyannensis* Bechstein, *in* Thomas Pennant's allgemeine Uebersicht der vierfüssigen Thiere, 2:732. Type locality, unknown (name applied to Pennant's "Guiana manatee").

1800. *Manatus Oronocensis* Bechstein, *in* Thomas Pennant's allgemeine Uebersicht der vierfüssigen Thiere, 2:732. Type locality, restricted to West Indies by Hatt (Bull. Amer. Mus. Nat. Hist., 66:535, September 10, 1934).

1800. *Trichechus Clusii* Shaw, General zoology . . . , 1: 246. Type locality, restricted to West Indies by Hatt (Bull. Amer. Mus. Nat. Hist., 66:536, September 10, 1934).

1800. *Trichechus Amazonicus* Shaw, General zoology . . . , 1:246. Type locality, restricted to West Indies by Hatt (Bull. Amer. Mus. Nat. Hist., 66:536, September 10, 1934).

1802. *Manatus minor* Daudin, Buffon's Hist. Naturelle, Didot ed., Quadrupeds, 14:134. Type locality, restricted to West Indies by Hatt (Bull. Amer. Mus. Nat. Hist., 66: 536, September 10, 1934).

1838. *Manatus atlanticus* Oken, Allgemeine Naturgeschichte . . . , 2(7):1098. Type locality, restricted to West Indies by Hatt (Bull. Amer. Mus. Nat. Hist., 66:536, September 10, 1934).

1897. *Manatus Koellikeri* Kükenthal, Zool. Anzeiger, 20:40. Type locality, Surinam, northern South America.

RANGE (Miller and Kellogg, 1955:790, unless otherwise noted).—Coasts and coastal rivers of the West Indies and adjacent mainland from Veracruz: Alvarado (32229 KU), thence southeastward to northern South America.

Order PERISSODACTYLA—Perissodactyls

Main axis of foot lies directly over third digit (mesaxonic); third digit on both forefeet and hind feet larger than any of the other digits; digit symmetrical with free border of ungual phalanx evenly rounded; never plantigrade; femur having third trochanter; astragalus having pulleylike articulation with tibia but distal surface flattened; fibula not articulating with calcaneum. Alisphenoid canal present; nasals expanded posteriorly; thoracic vertebrae plus lumbar vertebrae never fewer than 22, usually 23; os penis absent; clavicle absent; horns as true bony outgrowths absent in Recent families. Premolars and molars in continuous series; crowns massive, quadrate, transversely ridged or complex; posterior premolars often resembling true molars in size and structure; crown of last molar commonly bilobed; teeth lophodont, brachydont to hypsodont. Stomach simple; caecum large; mammae inguinal; gall-bladder absent; testes scrotal.

Suborder CERATOMORPHA

Cement absent on crowns of teeth; lower molars with two transverse ridges (Tapiroidea) or partially bicrescentic (Rhinoceratoidea); hypoconulid of m3 usually absent; lower molars asymmetrical with anterior crest of hypoconid, when present, attached to, or pointing toward, protoconid; manus tridactyl or tetradactyl, pes tridactyl; ulna and fibula not reduced to vestiges, not ankylosed with radius and tibia, respectively; body heavy; neck short; limbs short and stocky.

Superfamily TAPIROIDEA

Incisors chisel-shaped, reduced to no fewer than $\frac{3}{2}$; canines conical, never lost; cheek-teeth brachydont; protoloph and metaloph at right angles to ectoloph; parastyle and metacone well developed; never horned; postglenoid- and paroccipital-processes well developed.

Family TAPIRIDAE—Tapirs

Legs and feet short; manus tetradactyl, pes tridactyl; canines well developed; canine-premolar diastema of moderate length; posterior three premolars molariform; cheek-teeth with simple pattern, uppers with lophs, lowers with 2 transverse crests; short proboscis; nasal bones shortened.

Genus Tapirus Brünnich—Tapirs

American species revised by Hershkovitz, Proc. U.S. Nat. Mus., 103:465–496, May 18, 1954.

1772. *Tapirus* Brünnich, Zoologiae fundamenta . . . , pp. 44, 45. Type, *Hippopotamus terrestris* Linnaeus. For use of Brünnich instead of Brisson as author of *Tapirus* see Hopwood, Proc. Zool. Soc. London, 117:534–536, October 30, 1947, and Hershkovitz, Proc. U.S. Nat. Mus., 103:466, May 18, 1954.

1779. *Tapir* Blumenbach, Handbuch der Natürgeschichte, 1:129. Type, *Tapir suillus* Blumenbach [= *Hippopotamus terrestris* Linnaeus].

1827. *Syspotamus* Billberg, Synopsis faunae Scandinaviae, 1(1): Mammalia, conspectus A (before p. 1), a renaming of *Tapir* Gmelin, 1778.

1830. *Rhinochoerus* Wagler, Natürliches System der Amphibien . . . , p. 17, a renaming of *Tapirus* Brisson.

1865. *Elasmognathus* Gill, Proc. Acad. Nat. Sci. Philadelphia, 17:183. Type, *Elasmognathus bairdii* Gill. Not Fieber, 1844, an hemipteran.

1872. *Tapyra* Liais, Climates, géologie, faune et géographic botanique du Brésil, p. 397, an emendation of *Tapirus* Brünnich.

1873. *Cinchacus* Gray, Hand-list of the edentate, thick-skinned, and ruminant mammals in the British Museum, p. 34. Type, *Tapirus leucogenys* Gray [= *Tapirus pinchaque* Roulin]. *Cinchacus* is regarded as a typographical error for *Pinchacus* by Hershkovitz (Proc. U.S. Nat. Mus., 103:469, May 18, 1954) and is so emended. (Valid as a subgenus according to Hershkovitz, *loc. cit.*)

1903. *Tapirella* Palmer, Science, n.s., 17:873, May 29, a renaming of *Elasmognathus* Gill.

1913. *Acrocodia* Goldman, Proc. Biol. Soc. Washington, 26: 65. Type, *Tapirus indicus* Desmarest. (Valid as a subgenus according to Hershkovitz, Proc. U.S. Nat. Mus., 103:467, May 18, 1954.)

Body stocky, neck long; upper lip long, prehensile; ears short, tail short; legs short, stout; skin thick. Forefeet with 4 toes, hind feet with 3 toes; third digit longest. Skull with no trace of postorbital bar; anterior nasal openings enlarged, recessed; nasal bones small, arched. Teeth brachydont, without cement; molars bilophodont, without extra cusps or crests; deciduous dentition well developed and long persisting. Dentition, i. $\frac{3}{3}$, c. $\frac{1}{1}$, p. $\frac{4}{3}$, m. $\frac{3}{3}$.

Subgenus Tapirella Palmer

1865. *Elasmognathus* Gill, Proc. Acad. Nat. Sci. Philadelphia, 17:183. Type, *Elasmognathus bairdii* Gill. Not Fieber, 1844, an hemipteran.

1903. *Tapirella* Palmer, Science, n.s., 17:873, May 29, a renaming of *Elasmoganthus* Gill.

"Head flattened dorsally, a low mane, not always well defined, extending from front of ears to withers; proboscis longer and bulkier than in other American species; pelage of lowland populations thin and not completely hiding skin, in highland populations longer, thicker, and completely hiding skin; hoofs broad, larger than in subgenus *Tapirus* with middle hoof always wider than long. Dorsal contour of skull . . . flattened or slightly rounded; median frontal line usually placed abruptly above level of nasals, roughly parallel to horizontal plane of nasals but strongly divergent from horizontal plane of maxillary tooth row; superior longitudinal parietal ridges separated by a broad flat table, not uniting to form a sagittal crest . . . ossification of vertical mesethmoid plate extending beyond tips of nasals to angle between premaxillae in old adults; outer anterodorsal surface of maxillae produced upward to form thin, parallel-sided plates embracing mesethmoid; posterolateral maxillary process projecting back to form inner lateral wall of narial meatus but not contacting nasal bone; posterolateral border of premaxilla rounded or angular and embraced by maxilla; nasal without descending process overlapping maxilla; two ossification centers of nasal sometimes persistent in fully ossified bone of adult. First upper premolar as in subgenus *Tapirus*; upper incisors orthodont" (Hershkovitz, 1954:488–489).

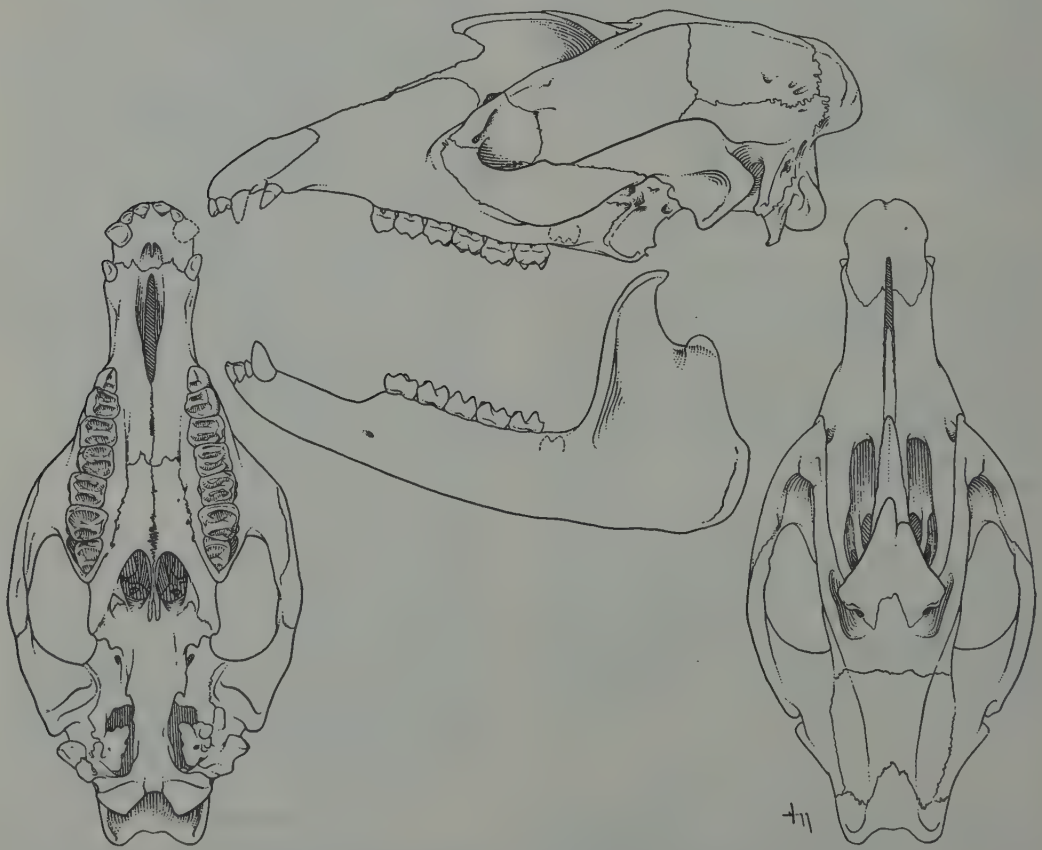


Fig. 524. *Tapirus bairdii*, 60 km. SE Jesús Carranza, 450 ft., Veracruz, No. 24558 K.U., ♀, X ¼.

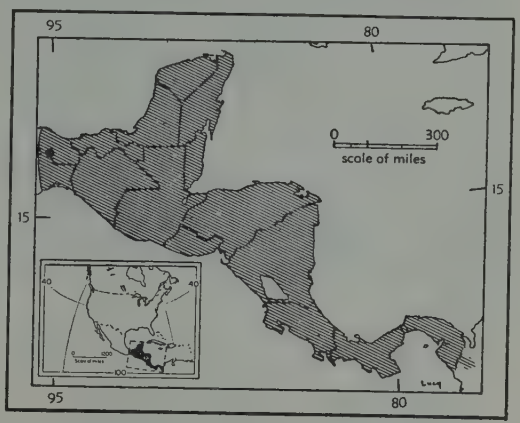
Tapirus bairdii (Gill)
Baird's Tapir

1865. *Elasmognathus bairdii* Gill, Proc. Acad. Nat. Sci. Philadelphia, 17:183, type from Isthmus of Panamá, Panamá.
1882. *Tapirus* (*Elasmognathus*) *bairdi* [*sic*], Sumichrast, Naturaleza, 5:332.
1870. *Elasmognathus dowii* Gill, Amer. Jour. Sci., 50:142, type from Guatemala.

External measurements of an adult from Veracruz: 2020; 70; 375; 140. Skull of an adult female from Nicaragua: Greatest length, 420; condylobasal length, 395; zygomatic width, 195; palatal length, 201. ". . . entire margin or only upper borders and lower edges of ears either conspicuously trimmed or spotted with white or buff, or uniformly brown or black; lips edged white, gray or buff; cheeks paler than crown, the contrastingly paler color usually continuing onto throat, chest, and, to a varying degree, on belly; chin darker than cheeks and lips; upper parts of head and body, sides, and limbs light drab to brown in palest individuals, dark brown to black in darkest individuals. Juvenal pelage marked by a variable pattern of yellow and white spots and stripes covering entire body" (Hershkovitz, 1954: 468).

Tapirs, inhabitants of tropical areas, are primarily nocturnal. They frequent swamps or water courses, eat aquatic vegetation and browse on forest foliage, and are more or less solitary. Breeding seemingly takes place at any time of year. Females usually give birth to a single young; twins are rare.

MARGINAL RECORDS (Hershkovitz, 1954:496).—Veracruz: Buena Vista, thence northward to coast and along Caribbean Coast south to South America, thence northward along Pacific Coast to Oaxaca: *Istmo de Tehuantepec.*



Map 486. *Tapirus bairdii.*

Order ARTIODACTYLA—Artiodactyls

Main axis of foot lies between 3rd and 4th digits (paraxonic); toes 2 or 4 (except Tayassuidae), 1st (inner) digit suppressed; 3rd and 4th digits subequal and larger than lateral pair (when present); ungual phalanges of 3rd and 4th digits flattened on inner surface and more or less symmetrical to vertical axis of foot; never plantigrade. Femur lacking 3rd trochanter; distal articular surface of astragalus divided into 2 nearly equal facets which rest on navicular and cuboid; magnum articulates freely with scaphoid; fibula articulating with calcaneum. Alisphenoid canal absent; nasals not markedly expanded posteriorly; clavicle generally absent; thoracic plus lumbar vertebrae total 19; os penis absent. Premolars generally simpler than molars; upper premolars usually with a single lobe, upper molars bilobed; last lower molar usually with 3 lobes; teeth bunodont to selenodont, brachydont to hypsodont. Stomach more or less complex; caecum small; cerebral hemispheres well convoluted; uterus bicornuate; mammae inguinal or abdominal; indeciduate placenta, diffuse or cotyledonary; testes scrotal.

Key to North American Families of Artiodactyla

1. Frontal appendages absent; 3 hoofs (one vestigial) present on hind foot; upper incisors present; canines well developed; lower canines not incisiform. . . Tayassuidae, p. 994
1′. Frontal appendages present (at least in males); 4 or 2 hoofs (2 or none vestigial) present on hind foot; upper incisors absent; upper canines absent or poorly developed; lower canines incisiform.
   2. Frontal appendages not deciduous, usually present in both sexes; lacrimal articulating with nasal. . . . Bovidae, p. 1023
   2′. Frontal appendages deciduous, absent in females of some species; lacrimal not articulating with nasal.
      3. Frontal appendages composed of bone. . . . . Cervidae, p. 999
      3′. Frontal appendages composed of fused hair surrounding bony core. Antilocapridae, p. 1021

Suborder SUIFORMES

Upper incisors present; horns or antlers absent; metacarpal and metatarsal bones of main pair of toes not fused; feet short, usually tetradactyl. Dentition little reduced (44 teeth in one living family, Suidae); cheek-teeth bunodont or bunoselenodont (Hippopotamidae) in Recent genera; canines large, triangular in cross-section; stomach simple or complex.

Superfamily SUOIDEA

Snout elongate, mobile, with expanded, truncate, nearly naked, flat, oval, terminal surface in which nostrils are located; manus tetradactyl, pes tetradactyl or tridactyl; incisors rooted; cheek-teeth bunodont; caecum present.

Family TAYASSUIDAE—Peccaries

I3 absent; P $\frac{4}{1}$ absent; upper canines directed downwards, not outwards or upwards; stomach complex; pes tridactyl; premolars and molars forming a continuous series, gradually increasing in size from first to last; P $\frac{4}{4}$ nearly as complex as molars; molars with square, quadricuspidate crowns. Dentition, i. $\frac{2}{3}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$.

Genus Tayassu G. Fischer—Peccaries

1814. *Tayassu* G. Fischer, Zoognosia tabulis synopticis illustrata . . . , 3:284. Type by tautonomy, *Tayassu pecari* G. Fischer. *Tayassu* G. Fischer and *Pecari* Reichenbach regarded as congeneric by Tate, Bull. Amer. Mus. Nat. Hist., 76:223, October 20, 1939.

1775. *Tagassu* Frisch, Das Natur-System der vierfüssigen Thiere . . . , p. 3. Type, "Das amerikanische einzige Schwein-Geschlechte," or *Sus tajacu* Linnaeus (see Palmer, N. Amer. Fauna, 23:955, January 23, 1904). Frisch's names are unavailable in zoology because the system he employed was non-Linnaean (see Sherborn, Index animalium . . . , sect. 1, p. xxv, 1902; Thomas and Miller, Ann. Mag. Nat. Hist., ser. 7, 16:461–464, October 1905; and Hershkovitz, Jour. Mamm., 29:272–275, August 31, 1948).

1817. *Dicotyles* G. Cuvier, Le regne animal . . . , 1:237. Type, by subsequent designation (Gray, Proc. Zool. Soc. London, p. 45, May, 1868), *Dicotyles labiatus* G. Cuvier [= *Tayassu pecari* G. Fischer].

1835. *Pecari* Reichenbach, Bildergalerie der Thierwelt . . . , Heft 6, p. 1. Type, *Sus torquatus* Cuvier [= *Sus tajacu* Linnaeus].

1901. *Olidosus* Merriam, Proc. Biol. Soc. Washington, 14: 120, July 19. Type, *Sus albirostris* Illiger [= *Tayassu pecari* G. Fischer].

See characters of the family.

KEY TO NORTH AMERICAN SPECIES OF TAYASSU

1. Whitish or yellowish collar extending from mane over shoulders to throat; maxillae not laterally expanded above maxillary tooth-row; distinct ridge on palate from C to P2. *T. tajacu*, p. 995

1'. Collar absent; maxillae laterally expanded above maxillary tooth-row from level of canine posterior to level of M1; distinct ridge on palate from C to P2 lacking. *T. pecari*, p. 997

Tayassu tajacu
Collared Peccary

External measurements: 870–940; 19–55; 180–200; 84–100; sexes similar in size. Weight 40–65 lbs. Grizzled grayish to blackish throughout, excepting yellowish tinge on cheeks and whitish to yellowish collar extending from mane over shoulders to throat; feet blackish. Young yellowish-brown, grizzled with blackish; black stripe down back; grayish-yellow ventrally. Large, well-developed musk gland on middorsal line of rump; mane of long, stiff hairs along middorsal line from crown to rump. Greatest length of skull, 234–248; condylobasal length, 199–217; zygomatic breadth, 97.0–114.7. Rostrum narrow, slightly convex dorsally; sides of rostrum not flattened, divided by zygomatic ridge; maxillae not laterally expanded above maxillary tooth-row; distinct ridge on palate from C to P2; infraorbital canals rounded; molars having well-developed cingula, and cusps not closely connected by intermediate cusplets.

The collared peccary is gregarious, occurring in bands of from 3–25 or more. Young, born after a gestation period of 112–116 days, have been reported in April, August, and November. Sows give birth usually to twins but as many as 6 fetuses have been recorded. Food consists mainly of fruits, nuts, berries, herbs, roots, beans, bird eggs, and small, slow-moving animals.

Tayassu tajacu angulatus (Cope)

1889. *Dicotyles angulatus* Cope, Amer. Nat., 23:147, February, type from Guadalupe River, Texas.
1953. *Tayassu tajacu angulatus*, Dalquest, Louisiana State Univ. Studies, Biol. Sci. Ser., 1:207, December 28.

MARGINAL RECORDS.—Texas: Montague County (Jennings and Harris, 1953:6); McLennan County (Strecker,

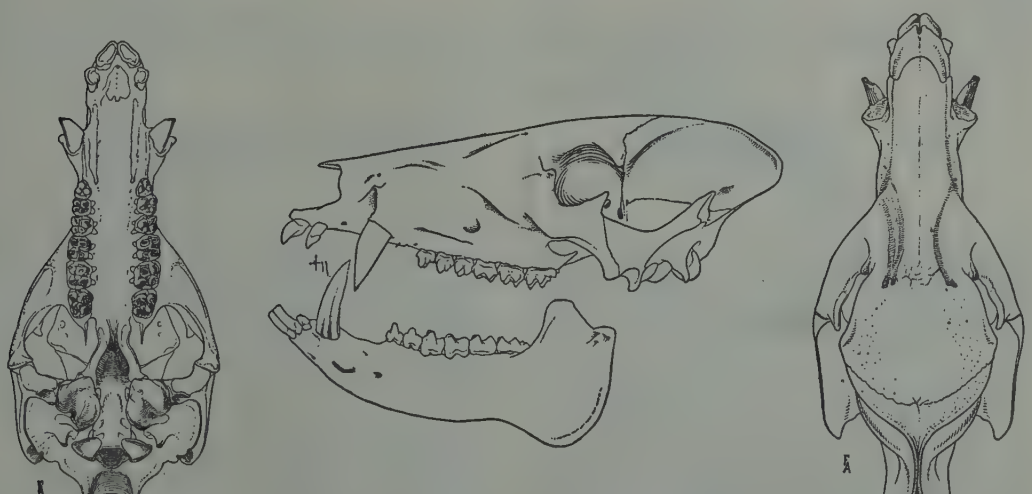
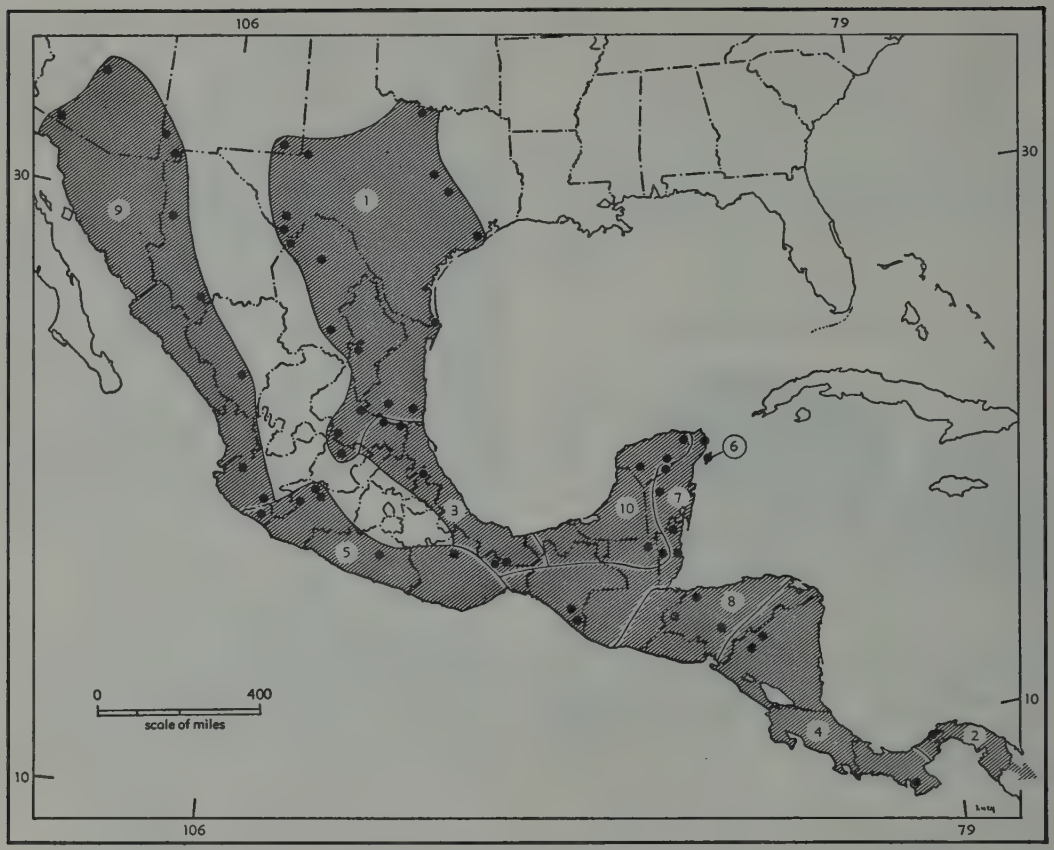


Fig. 525. *Tayassu tajacu sonoriensis*, Ferguson Ranch, 35 mi. from Florence, Pinal Co., Arizona, No. 34177 M.V.Z., ♂, X ⅓.



Map 487. *Tayassu tajacu.*

Guide to subspecies
1. *T. t. angulatus*
2. *T. t. bangsi*
3. *T. t. crassus*
4. *T. t. crusnigrum*
5. *T. t. humeralis*
6. *T. t. nanus*
7. *T. t. nelsoni*
8. *T. t. nigrescens*
9. *T. t. sonoriensis*
10. *T. t. yucatanensis*

1926:7); Brazos County (Peterson, 1946:167); Brazoria County (Jennings and Harris, 1953:6); mouth of Rio Grande (*ibid.*). Tamaulipas: approx. 10 mi. N Cues (Leopold, 1947:443, map); *Rancho del Cielo* (Goodwin, 1954:15); Alta Cima (*ibid.*). San Luis Potosí: Presa de Guadalupe (Dalquest, 1953b:207). Guanajuato: approx. 15 mi. S San Bartolo de Berrio (Leopold, 1947:443, map). San Luis Potosí: Bledos (Dalquest, 1953b:207). Nuevo León: approx. 10 mi. E San Rafael (Leopold, 1947:443, map). Coahuila: Jaral (Baker, 1956:318); 6 mi. NE Hda. La Mariposa, 1700 ft. (*ibid.*); approx. 15 mi. W Los Alamos (Leopold, 1947:443, map). Texas: vicinity of Mule Ear Peaks, Brewster Co. (Borell and Bryant, 1942:40); Christmas Mts. (*ibid.*). New Mexico: eastern edge Pecos Valley (V. Bailey, 1932:10). Texas: 10–15 mi. N Monahans (V. Bailey, 1905: 59).

Tayassu tajacu bangsi (Goldman)

1917. *Pecari angulatus bangsi* Goldman, Proc. Biol. Soc. Washington, 30:109, May 23, type from Boca de Cupe, 250 ft., Darién, Panamá.

MARGINAL RECORDS.—Panamá: Gatun, Canal Zone (Goldman, 1917:110), thence eastward into South America.

Tayassu tajacu crassus Merriam

1901. *Tayassu angulatus crassus* Merriam, Proc. Biol. Soc. Washington, 14:124, July 19, type from Metlatoyuca, Puebla.

1953. *Tayassu tajacu crassus*, Dalquest, Louisiana State Univ. Studies, Biol. Sci. Ser., 1:206, December 28.

MARGINAL RECORDS.—San Luis Potosí (Dalquest, 1953b:206): 6½ mi. E Sabanito; Ebano, thence eastward to Caribbean Coast and southward along coast to Veracruz: *Arroyo Saoso, 37 km. E, 7 km. S Jesús Carranza* (39436 KU); 30 km. SSE Jesús Carranza, 300 ft. (32233 KU). Oaxaca: Tollosa (54829 KU). Puebla: type locality. *E Hidalgo* (Miller and Kellogg, 1955:792). *NE Querétaro* (*ibid.*).

Tayassu tajacu crusnigrum Bangs

1902. *Tayassu crusnigrum* Bangs, Bull. Mus. Comp. Zool., 39:20, April, type from Boquete, Chiriquí, Panamá.

MARGINAL RECORDS.—Nicaragua: Río Coco (J. A. Allen, 1910:94). Panamá: Paracoté (Bole, 1937:186). Nicaragua: San Rafael del Norte (J. A. Allen, 1910:94).

Tayassu tajacu humeralis Merriam

1901. *Tayassu angulatus humeralis* Merriam, Proc. Biol. Soc. Washington, 14:122, July 19, type from Armería, Colima.

MARGINAL RECORDS (Leopold, 1947:443, map, unless otherwise noted).—Michoacán: near Penjamillo de Degollado; approx. 5 mi. W Panindicuaro. Guerrero: near Chilpancingo. Oaxaca: near Jayacatlán; *Isthmus of Tehuantepec* (Miller and Kellogg, 1955:793), thence northward along coast to Colima: type locality. Michoacán: near Los Reyes.

Tayassu tajacu nanus Merriam

1901. *Tayassu nanus* Merriam, Proc. Biol. Soc. Washington, 14:102, July 19, type from Cozumel Island, Quintana Roo. Known only from Cozumel Island. Regarded by Hershkovitz (Fieldiana-Zool., 31:566, July 10, 1951) as doubtfully distinct from *yucatanensis* and possibly based on an introduced population.

Tayassu tajacu nelsoni (Goldman)

1926. *Pecari angulatus nelsoni* Goldman, Proc. Biol. Soc. Washington, 39:48, July 30, type from Huehuetán, 500 ft., Chiapas.

1950. [*Tayassu tajacu*] *nelsoni*, Handley, *in* Saunders, Holloway, and Handley, U.S. Dept. Interior, Fish and Wildlife Serv., Special Sci. Rept.: Wildlife, No. 5:156, June.

MARGINAL RECORDS.—Quintana Roo: La Vega (Goldman, 1926:49, as *nigrescens*; here assigned to *nelsoni* on geographic grounds), thence southward along coast to British Honduras: Stann Creek Valley (Hershkovitz, 1951: 566). Guatemala: *Pacific slope* (Handley, 1950:156). Chiapas: type locality; 3 km. SW Mapastepec (Villa, 1949:523). British Honduras: Kate's Lagoon (Hershkovitz, 1951:566). Quintana Roo: Esmerelda (Hatt and Villa, 1950:237). Yucatán: Tekom (Hershkovitz, 1951:566).

Tayassu tajacu nigrescens (Goldman)

1926. *Pecari angulatus nigrescens* Goldman, Proc. Biol. Soc. Washington, 39:49, July 30, type from Chamelecón, Cortés, Honduras. Regarded as identical with *nelsoni* by Hershkovitz, Fieldiana-Zool., 31:566, July 10.

1950. [*Tayassu tajacu*] *nigrescens*, Handley, *in* Saunders, Holloway, and Handley, U.S. Dept. Interior, Fish and Wildlife Serv., Special Sci. Rept.: Wildlife, No. 5:156, June.

MARGINAL RECORDS.—Guatemala: *Caribbean slope* (Handley, 1950:156). Honduras: type locality; Cantoral (Goodwin, 1942:188); Las Flores (*ibid.*).

Tayassu tajacu sonoriensis (Mearns)

1897. *Dicotyles angulatus sonoriensis* Mearns, Preliminary diagnoses of new mammals . . . *Mephitis, Dorcelaphus,* and *Dicotyles,* from the Mexican border of the United States, p. 3, February 11 (preprint of Proc. U.S. Nat. Mus., 20:469, December 24), type from San Bernardino River, Sonora, near monument No. 77, Mexican Boundary.

MARGINAL RECORDS.—Arizona: Fossil Creek (Mearns, 1907:167). New Mexico: Peloncillo Mts. (Cahalane, 1939: 436); SW Big Hatchet Peak (V. Bailey, 1932:11). Chihuahua: northern foothills Sierra Madre (Brand, 1937:52); approx. 15 mi. S Tecorichic (Leopold, 1947:443, map). Durango: approx. 5 mi. S Durango (*ibid.*). Jalisco: Los Masos (J. A. Allen, 1906:240); *Volcán de Fuego* (*ibid.*); La Ciénega (*ibid.*), thence northward along coast. Arizona: W of Growler Mine, Organ Pipe Cactus National Monument (Huey, 1942:362).

Tayassu tajacu yucatanensis Merriam

1901. *Tayassu angulatus yucatanensis* Merriam, Proc. Biol. Soc. Washington, 14:123, July 19, type from Tunkás, Yucatán.

MARGINAL RECORDS.—Yucatán: type locality. British Honduras: Mountain Pine Ridge (Murie, 1935:28). Guatemala: Uaxactún (*ibid.*). Yucatán: Ticul (Hatt, 1938:337).

Map 488. *Tayassu pecari.*

1. *T. p. ringens* 2. *T. p. spiradens*

Tayassu pecari
White-lipped Peccary

External measurements of a female of *T. p. spiradens* from Carillo, Costa Rica: 1040; —; 190; 80. Blackish dorsally, frequently tinged with tawny;

bases of hairs buffy; blackish ventrally, becoming grizzled in pectoral and inguinal regions; feet whitish; muzzle, chin, and cheeks white or yellowish-white. Young russet-colored, blackish middorsally from crown to rump. Cranial measurements of the type specimen of *T. p. spiradens*: Greatest length of skull, 280.5; condylobasal length, 245.0; zygomatic breadth, 120.0. Skull large and heavy; rostrum broad, flattened or slightly concave dorsally; sides of rostrum flattened, not divided by zygomatic ridge; maxillae laterally expanded above maxillary tooth-row from level of canine posterior to level of M1; distinct ridge on palate from C to P2 lacking; infraorbital canals elliptical; molars lacking well-developed cingula, but having cusps closely connected by intermediate cusplets.

The white-lipped peccary is more gregarious than the collared peccary, frequently traveling in bands of 50–100 or more. The species inhabits tropical forests. Foods and reproductive habits are thought to be much the same as in *T. tajacu*.

Tayassu pecari ringens Merriam

1901. *Tayassu albirostris ringens* Merriam, Proc. Biol. Soc. Washington, 14:121, July 19, type from Apazote, Campeche.

1902. *Tayassu pecari ringens*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:166, July 1.

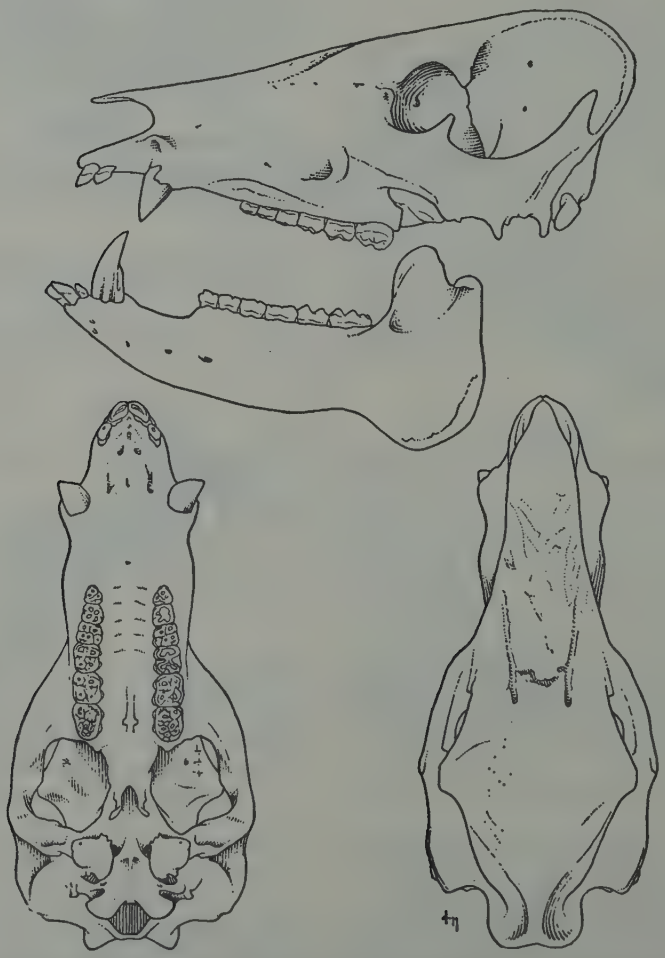


Fig. 526. *Tayassu pecari ringens*, 20 km. E Jesús Carranza, Veracruz, No. 24562 K.U., ♂, X ⅓.

MARGINAL RECORDS.—Campeche: type locality. Guatemala: Uaxactún (Murie, 1935:28); *tropical lowlands of both coasts* (Handley, 1950:156). *N Chiapas* (Villa, 1951: 12). Veracruz: 20 km. E Jesús Carranza (*ibid.*), thence along coast to point of beginning.

Tayassu pecari spiradens Goldman

1912. *Tayassu albirostris spiradens* Goldman, Proc. Biol. Soc. Washington, 25:189, December 24, type from Talamanca [= Sipurio, Río Sixaola, Limón, near Caribbean Coast], Costa Rica.
1920. *Tayassu pecari spiradens* Goldman, Smiths. Miscl. Coll., 69(5):74, April 24.

MARGINAL RECORDS.—Costa Rica: Carillo, San José (Goodwin, 1946:447), thence eastward into South America.

SUBORDER RUMINANTIA

Upper incisors absent; horns or antlers usually present, at least in males; metatarsal bones of main pair of toes fused into a single cannon-bone (same is true of metacarpal bones), terminating inferiorly in a pair of pulleylike condyles; metacarpals and metatarsals of lateral toes incomplete or absent; navicular and cuboid of tarsus united. Lower canines incisiform, forming, with incisors, a semicircle of spatulate pairs which bite against a callous pad in upper jaw; cheek-teeth selenodont. Stomach 4-chambered; placenta cotyledonous.

SUPERFAMILY CERVOIDEA

Chiefly browsers; antlers usually present only in males, shed and replaced annually, covered with "velvet" that atrophies and is rubbed off when antlers reach full growth.

FAMILY CERVIDAE—Cervids

Frontal appendages (when present) of (usually) branched, bony, solid, deciduous antler-tissue, supported on permanent skin-covered pedicels. Upper canines long in antlerless species, but absent or poorly developed in North America cervids all of which have antlers in at least males; lower canines incisiform; cheek-teeth selenodont, generally brachydont. Lateral toes generally present, with constituent bones fully developed; lateral metacarpals lacking either upper (telemetacarpalian) or lower (plesio-metacarpalian) ends. Gall bladder usually absent; 2 pair mammae present (except in *Moschus* ?); facial glands present (except in *Capreolus*); tarsal, metatarsal, and interdigital glands may be present; placenta with few cotyledons.

KEY TO NORTH AMERICAN GENERA OF CERVIDAE

1. Antlers more or less palmate.
   2. Antlers strongly palmate; length of skull more than 500. . . . . *Alces*, p. 1014
   2′. Antlers slightly palmate; length of skull less than 500. . . . . *Rangifer*, p. 1017
1′. Antlers not palmate.
   3. Posterior narial cavity divided by vomer.
      4. Antlers unbranched, less than ½ length of head; auditory bullae slightly inflated. . . . *Mazama*, p. 1012
      4′. Antlers generally branched, more than ½ length of head; auditory bullae moderately inflated. *Dama*, p. 1003
   3′. Posterior narial cavity not completely divided by vomer. . . . . *Cervus*, p. 999

Genus Cervus Linnaeus—Wapiti and Allies

1758. *Cervus* Linnaeus, Syst. nat., ed. 10, 1:66. Type, *Cervus elaphus* Linnaeus.
1799. *Alce* Blumenbach, Handbuch Naturgeschichte, p. 697. Type, *Alce gigantea* Blumenbach [a Pleistocene fossil].
1827. *Elaphus* Hamilton-Smith, *in* Griffith, The animal kingdom . . . by the Baron Cuvier . . . , 5:307. Type, *Cervus elaphus* Linnaeus.
1827. *Rusa* Hamilton-Smith (*op. cit.*:309). Type, *Cervus unicolor* Kerr.
1836. *Hippelaphus* Bonaparte, Iconografia della fauna Italia . . . , 1 (fasc. xv–xvi):4, a renaming of *Rusa* Hamilton-Smith. Not Reichenbach, 1835.
1838. *Harana* Hodgson, Ann. Nat. Hist., 1:154. Type, *Cervus wallichii* Cuvier.
1838. *Rucervus* Hodgson, Ann. Nat. Hist., 1:154. Type, *Cervus elaphoides* Hodgson [= *Cervus duvaucelii* Cuvier].
1841. *Pseudocervus* Hodgson, Jour. Asiatic Soc. Bengal, 10: 914, July–December. Type, *Cervus wallichii* Cuvier.
1843. *Panolia* Gray, List of the . . . Mammalia in the . . . British Museum, p. 180. Type, *Panolia acuticornis* Gray [= *Cervus eldii* M'Clelland].
1844. *Megaceros* Owen, Rept. British Assoc. Adv. Sci., for 1843, pp. 237–239. Type, *Megaceros hibernicus* Owen [a Pleistocene fossil].
1846. *Hippelaphus* Sundevall, K. Svenska Vetensk. Akad. Handl., for 1844, p. 177. Type, *Cervus hippelaphus* Cuvier. Not Reichenbach, 1835.
1846. *Strongyloceros* Owen, A history of British fossil mammals and birds, p. 470. Type, *Cervus elaphus* Linnaeus.
1846. *Recervus* Gray, Catalogue of the Mammalia . . . Nepal and Tibet in the British Museum, p. 33, an emendation of *Rucervus* Hodgson.
1870. *Sika* Sclater, Proc. Zool. Soc. London, p. 115, June. Type, *Cervus sika* Temminck [= *Cervus nippon* Temminck].
1870. *Recurvus* Jäger and Bessels, Petermann's Geog. Mitth., 16:87, a misprint.
1872. *Pseudaxis* Gray, Catalogue of the ruminant Mammalia . . . , p. 70. Type, *Cervus taiouanus* Blyth.
1874. *Elaphoceros* Fitzinger, Sitzungsber, k. Akad. Wiss., Wien, 68:347, 352, for 1873. Type, *Cervus sika* Temminck [= *Cervus nippon* Temminck].
1876. *Strangalioceros* Alston, Zool. Record, for 1874, 9:556, a *lapsus*?
1876. *Strangyloceros* Alston (*ibid.*), a *lapsus*?

1888. *Sambur* Heude, Mem. Hist. Nat. Empire Chinois, 2:8. Type, *Cervus aristotelis* Cuvier.
1888. *Roussa* Heude, Mem. Hist. Nat. Empire Chinois, 2:8, an emendation?
1897. *Russa* Jentink, Notes Leyden Mus., 19:63, an emendation?
1898. *Sikaillus* Heude, Mem. Hist. Nat. Empire Chinois, 4:98. Type, *Cervus sika* Temminck [= *Cervus nippon* Temminck].
1898. *Sica* Trouessart, Catalogus mammalium . . . , fasc. 4:878, a renaming of *Sika*.
1899. *Eucervus* Acloque, Faune de France, Mammals, p. 71. Type, *Cervus elaphus* Linnaeus. Not Gray, 1866.
1930. *Prewalskium* Flerov, C.R. Acad. Sci. U.R.S.S., p. 115. Type, *Cervus albirostris* Prewalski.
1943. *Thaocervus* Pocock, Jour. Bombay Nat. Hist. Soc., 43: 554, 559. Type, *Rucervus schomburgki* Blyth.

Size small to large; antlers subcylindrical or somewhat flattened; brow tine and at least 2 other tines present; muzzle bare; tail medium to short; coat uniformly colored or spotted; main hoofs long, pointed, hind pair united through most of basal length by deep interungual membrane; no specialized gland or deep interdigital cleft on front of fore-pasterns or hind pasterns; skull long, narrow; cheek-teeth moderately short-crowned, wide; crowns of lower incisors varying in size; upper canines usually present; young generally spotted. Dentition, i. $\frac{0}{3}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$.

Cervus canadensis
Wapiti

External measurements: (♂) 2032–2972; 80–213; 464–660. Weight to 1100 lbs., average about 650 lbs. Females average smaller and lighter. Basilar length of skull, (♂) 414–455; zygomatic breadth, (♂) 173–203; length of upper molar series, (♂) 128–140. Females average smaller than males. Upper parts light grayish brown to dark brown; head, mane, neck, and legs dark brown, almost black; underparts darker than back; rump patch whitish to rich tawny; summer pelage more tawny. Lacrimal vacuity widely open, pit well developed; vomer low posteriorly, not dividing posterior nares into 2 chambers; base of pedicel extending conspicuously over posterior part of orbital cavity. Maxillary canine present in both sexes; lower incisors distinctly, but not excessively, differentiated in size and form. Antlers generally with at least 5 tines, including bez; brow tine forms obtuse angle with beam.

Wapiti formerly occurred in most of central North America, but have been extirpated in many areas and have been reintroduced in some localities. Wapiti feed on grasses, sedges, a variety of herbs, and many browse plants. The breeding season is in September and October, and a cow has one young (rarely twins) in May or June.

Ellerman and Morrison-Scott (1951:367) indicate that they regard the wapiti as the same species (*elaphus*) as the red deer. In the absence of intergradation between *C. canadensis* and *C. elaphus* we treat the two as distinct. Likewise, *C. merriami* and *C. nannodes* are here treated as distinct species, although Lydekker and others regard them, probably correctly, as subspecies of *C. canadensis*. *C. merriami* is extinct and *C. nannodes* exists on limited ranges under the jurisdiction of man; intergradation with *canadensis* has not been demonstrated as yet for either *nannodes* or *merriami*.

Cervus canadensis canadensis Erxleben

1777. [*Cervus elaphus*] *canadensis* Erxleben, Systema regni animalis . . . , p. 305. Type locality, eastern Canada [= Quebec].
1780. *Cervus canadensis* Borowski, Gemeinnüzzige Naturgeschichte des Thierreichs, 1(3):72.
1808. *Cervus wapiti* Barton, Jour. Med. Phys. Philadelphia, 3:36. Type locality, unknown.
1815. *Cervus major* Ord, *in* Guthrie, A new geogr., hist. and comm. grammar . . . , Philadelphia, ed. 2, 2:292, description on p. 306. Type locality, unknown.

MARGINAL RECORDS (Murie, 1951:22–46, unless otherwise noted).—Ontario: 200 mi. NE Lake Nipigon; Ottawa. New York: N branch Saranac. Pennsylvania: Pike County; Monroe County. Virginia (Handley and Patton, 1947:191): Clarke County; Bedford County. South Carolina: Fairfield County. Georgia: *Appalachian Mts.* Tennessee: near Nashville; Reelfoot Lake. Louisiana: near Mound, Madison Parish; [vicinity of] Colfax. Texas: *Panhandle*, thence northward in the plains to Alberta, and eastward to North Dakota: "*all . . . North Dakota.*" Minnesota: "*throughout the State.*"

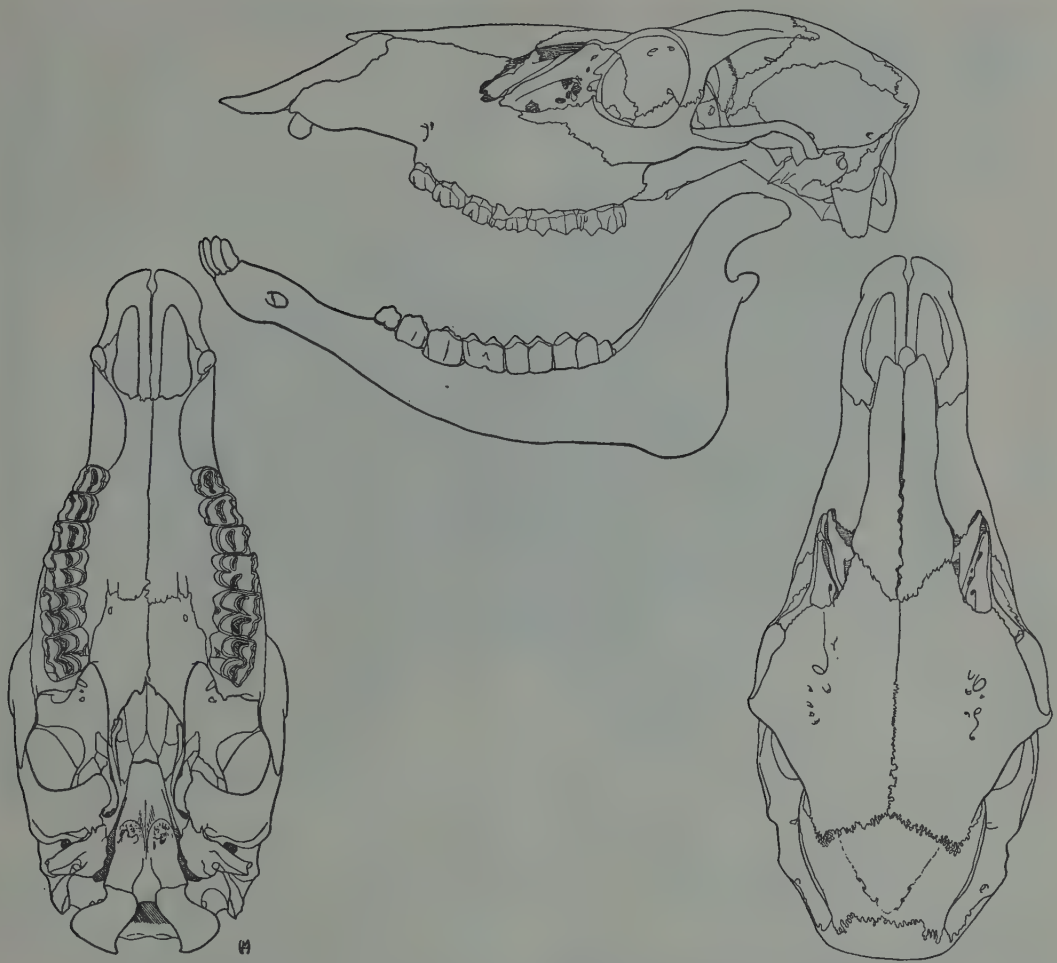


Fig. 527. *Cervus canadensis nelsoni*, 1 mi. N Green River Lakes, Sublette Co., Wyoming, No. 89267 M.V.Z., ♀, X ¼.

Cervus canadensis manitobensis Millais

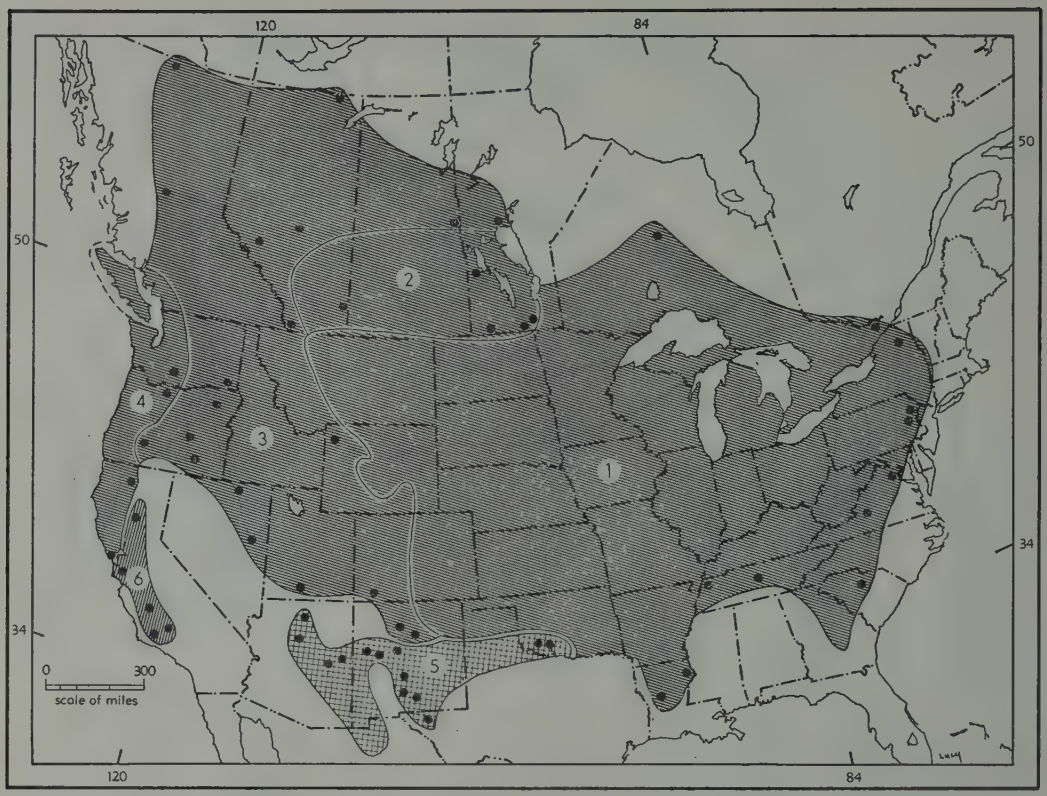
1915. *C[ervus]. c[anadensis]. manitobensis* Millais, *in* The gun at home and abroad . . . , p. 281, type from Manitoba and eastern Saskatchewan.

MARGINAL RECORDS (Soper, 1946:150, unless otherwise noted).—Saskatchewan: *central Saskatchewan* (Anderson, 1947:174). Manitoba: Duck Mtn.; Red River; Pembina Hills; Turtle Mtn. Alberta: Cypress Hills.

Cervus canadensis nelsoni V. Bailey

1935. *Cervus canadensis nelsoni* V. Bailey, Proc. Biol. Soc. Washington, 38:188, November 15, type from Yellowstone National Park, Wyoming.

MARGINAL RECORDS (Murie, 1951:32, 34–36, 39–40, unless otherwise noted).—Alberta: Fort Smith. Manitoba: N end Lake Winnipeg. Saskatchewan: Cumberland House. Alberta: Fort Saskatchewan, near Edmonton (Preble, 1908: 129); near head Pembina River (Hollister, 1912c:36); Waterton Lakes Park (Soper, 1947:159). Wyoming: type locality. New Mexico: Pecos River Mts.; Jemez Mts. Colorado: about Florida (J. A. Allen, 1893:70). Utah: Willis Creek, Bryce. Nevada: Stevenson's Canyon, Snake Range; Wild Bruneau Mts., vicinity Mountain City. Oregon: Steens Mts., headwaters Deschutes River; Burns (V. Bailey, 1936: 78); Blue Mts. Washington: Blue Mts.; *NE Washington* (Dalquest, 1948:394). British Columbia: Chilco Creek, 8 mi. E Vanderhoof (Munro, 1947:150); upper Liard River.



Map 489. Nominal species of *Cervus*.

1. *C. canadensis canadensis*
2. *C. canadensis manitobensis*
3. *C. canadensis nelsoni*
4. *C. canadensis roosevelti*
5. *C. merriami*
6. *C. nannodes*

Cervus canadensis roosevelti Merriam

1897. *Cervus roosevelti* Merriam, Proc. Biol. Soc. Washington, 11:272, December 17, type from Mount Elaine, on ridge between heads of Hoh, Elwha, and Soleduc rivers, near Mount Olympus, Mason Co., Washington.

1936. *Cervus canadensis roosevelti*, V. Bailey, N. Amer. Fauna, 55:81, August 29.

1827. *C[ervus]. occidentalis* Hamilton-Smith, *in* Griffith, The animal kingdom . . . by the Baron Cuvier . . . , 4: 101. Type locality, western North America (regarded by V. Bailey, N. Amer. Fauna, 55:81, August 29, 1936, as probably not identifiable as to genus or to locality).

MARGINAL RECORDS.—British Columbia: *Vancouver Island* (Murie, 1951:46); *coastal part of S British Columbia* (*ibid.*). Washington: headwaters Cispus River, S of Mt. Rainier (Taylor and Shaw, 1929:29). Oregon: near The Dalles (V. Bailey, 1936:82). California: vicinity Mt. Shasta (Murie, 1951:22); San Francisco Bay (*ibid.*), thence northward to point of beginning.

Cervus merriami Nelson
Merriam's Elk

1902. *Cervus merriami* Nelson, Bull. Amer. Mus. Nat. Hist., 16:7, January 16, type from head of Black River, about 9000 ft., White Mts., Apache Co., Arizona.

External measurements not available. Skull of adult ♂ topotype: occiput to front of premaxillae, 498; palatal length, 288; zygomatic breadth, 157; length of upper molar series, 137. Upper parts (winter) pale yellowish brown, head and neck seal brown; underparts dark seal brown; rump patch not sharply differentiated from remainder of body. From other North American species, *merriami* differs in having skull more massive, nasals broader and more flattened, and upper molar series heavier and more curved.

Merriam's elk is now extinct; parts of its range have been restocked with *C. canadensis nelsoni*.

MARGINAL RECORDS.—Arizona: near mouth of Little Colorado River (Murie, 1951:21); vicinity Camp Apache (Mearns, 1907:219); type locality. New Mexico (Murie, 1951:32): Datil Mts.; Manzano Mts. Oklahoma: Wichita Mts. (Blair, 1939:130); Rainy Mtn., about 40 mi. W Lawton (*ibid.*). Texas: Guadalupe Mts. (Davis, 1940:83). New Mexico (Murie, 1951:32, unless otherwise noted): Guadalupe Mts.; Sacramento Mts.; near Ruidoso (V. Bailey, 1932: 44); Gallina Mts. Chihuahua: *northwestern Chihuahua* (Brand, 1937:52). Arizona: head of Oak Creek, San Francisco Mts. (Mearns, 1907:219).

Cervus nannodes Merriam
Tule Elk

1905. *Cervus nannodes* Merriam, Proc. Biol. Soc. Washington, 18:24, February 2, 1905, type from Buttonwillow, Kern Co., California.

External measurements of the type, a 2-year-old male, are: 2030, 140, 620. Skull of type: basilar length, 358; zygomatic breadth, 155; palatal length, 230. Upper parts varying from buffy gray washed with fulvous to grizzled buffy whitish; rump patch small, narrow, white; front of legs and feet bright golden fulvous. Compared with a 2-year-old male from Manitoba, *nannodes* differs in: size smaller, frontoparietal region more depressed, bullae smaller, muzzle more constricted laterally behind canines, supraoccipital on top of head shorter, parietals longer, palatal length and length of palatal bones shorter, row of cheek-teeth relatively longer (after Merriam, 1905:25).

Tule elk occurred naturally in the San Joaquin and Sacramento valleys; now the elk are only in places where they have been introduced.

MARGINAL RECORDS (Murie, 1951:22).—California: Butte Creek, Butte Co.; vicinity of Bakersfield; Cuyama Valley; near Hernandez; S end San Francisco Bay.

Genus Dama Zimmermann—New World Deer

Reviewed by Kellogg (*D. virginiana*, pp. 31–55), and Cowan (*D. hemionus*, pp. 334–359), *in* The deer of North America (edited by W. P. Taylor), Wildlife Mgt. Inst., Washington, D. C., xvi + 4 + 668 pp., illustrated, 1956.

1780. *Dama* Zimmermann, Geographische Geschichte . . . , 2:129. Type, *Dama virginiana* Zimmermann. Not *Dama* Frisch, 1775, nor *Cervus dama* Linnaeus, 1758.
1832. *Odocoileus* Rafinesque, Atlantic Jour., 1:109. Type, *Odocoileus speleus* Rafinesque [= *Dama virginiana* Zimmermann, or a closely related subfossil form].
1827. *Mazama* Hamilton-Smith, *in* Griffith, The animal kingdom . . . by the Baron Cuvier . . . , 5:314. No type designated. Not *Mazama* Rafinesque, 1817.
1841. *Dorcelaphus* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, p. 140.
1842. *Cariacus* Lesson, Nouveau tableau du règne animal . . . , mammifères, p. 173. No type designated; based in part on *Mazama* Hamilton-Smith, 1827.
1842. *Aplacerus* Haldeman, Proc. Acad. Nat. Sci. Philadelphia, 1:188, a renaming of *Mazama* Hamilton-Smith.
1844. *Reduncina* Wagner, *in* Schreber, Die Säugthiere . . . , Suppl., 4:373. Based on *Mazama* Hamilton-Smith.
1855. *Macrotis* Wagner, *in* Schreber, Die Säugthiere . . . , suppl., 5:368. Type, *Cervus macrotis* Say [= *Cervus hemionus* Rafinesque]. Not Dejean, 1833, a coleopteran, nor Reid, 1836.
1866. *Eucervus* Gray, Ann. Mag. Nat. Hist., ser. 3, 18:338, October. Type, *Cervus hemionus* Rafinesque.
1874. *Otelaphus* Fitzinger, Sitzungsber. k. Akad. Wiss., Wien, 68:356, for 1873, a renaming of *Macrotis* Wagner.
1879. *Gymnotis* Fitzinger, Sitzungsber. k. Akad. Wiss., Wien, 78:343. Type, *Gymnotis wiegmanni* Fitzinger [= *Cervus gymnotis* Wiegmann].
1901. *Odocoelus* J. A. Allen, Amer. Nat., 35:449, June, an emendation.
1902. *Odontocoelus* Sclater, Ann. Mag. Nat. Hist., ser. 7, 9:290, April 1, an emendation.
1902. *Dama* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:19. Type, *Cervus virginianus* Boddaert. Not *Dama* Zimmermann, 1780.

Medium-sized deer; lateral metacarpals with only distal ends persisting; vomer high, dividing nostrils into 2 chambers posteriorly; antlers present only in males, large, with beam rising at marked angle to plane of face, generally dichotomously forked, with sub-basal snag; anterior prong of main fork more or less developed at expense of hind prong; main prongs with secondary forking; face long and narrow; rhinarium well developed; ears variable in size and hairiness; tail long to moderate, with or without hair below; coat uniformly colored; tarsal and usually metatarsal glands present; interdigital glands present on both forefeet and hind feet; lacrimal pits and preorbital glands small; lacrimal fossa shallow; lacrimal ducts on rim of orbit; upper canines usually absent; naviculo-cuboid of tarsus free from cuneiform; young spotted; premolars moderately proportioned; p3 open; tendency towards closed anterior fossette in P4; diastema moderately long. Dentition, i. $\frac{0}{3}$, c. $\frac{0}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$.

Key to North American Species of Dama

1. Tail brown above, fringed with white laterally, white below; ears approximately ½ length of head; metatarsal gland less than 25 mm. in length; antlers with one main beam from which tines rise vertically; lacrimal fossa shallow. . . . *D. virginiana*, p. 1007
1′. Tail tipped with black, white or black above; ears approximately ⅔ length of head; metatarsal gland more than 25 mm. in length; antlers branching dichotomously, tines about equal in size; lacrimal fossa deep. *D. hemionus*, p. 1004

Dama hemionus
Black-tailed Deer or Mule Deer

External measurements: (♂) 1370–1800, 106–230, 330–585, 118–250 (crown); (♀) 1160–1800, 115–200, 325–475, 118–243 (crown); length of metatarsal gland (♂) 25–150, (♀) 35–116. Weight of ♂ up to 456 lbs. Basilar length, (♂) 207–288, (♀) 202–266; zygomatic breadth, (♂) 94–133, (♀) 92–113; length of maxillary tooth-row, (♂) 58–85, (♀) 62–81. Upper parts (summer) reddish or yellowish tawny, (winter) dark brownish or rufous gray, speckled with whitish; dark brown patch extending nearly to eyes on forehead; brown patch on each side of nose; remainder of face white or gray; ears black on front border, whitish on inner surface; inner sides of buttocks and legs, abdomen, and throat white; remainder of underparts blackish brown; tail black-tipped, white elsewhere above and below, or black above and white below. Antlers with short sub-basal snag, beam curving outwards and upwards, forking dichotomously, the prongs about equal in size.

Mule deer (called black-tailed deer in northwest Pacific coastal area) inhabit broken country, open plains, brush or woods. The bounding gait of this deer seems well-suited to rough terrain. Mule deer mainly browse on a variety of woody plants, but also graze on grasses and forbs. The breeding season is in November and December and generally 2 fawns (1–3) are born in May and June.

Dama hemionus californica (Caton)

1876. *Cervus macrotis* var. *Californicus* Caton, Amer. Nat., 10:464, August. Type locality, near Gaviota Pass, 1050 ft., 40 mi. up the coast (west) from Santa Barbara, Santa Barbara Co., California.

1902. *Dama h[emionus]. californica*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:20, February 1.

MARGINAL RECORDS.—California (Cowan, 1936:214, unless otherwise noted): Strawberry Valley, Yuba Co.; near N Fork Silver Creek; Dardanelles; near Mirror Lake, Yosemite Valley (Longhurst and Chattin, 1941:11); 6 mi. N Cedar Grove; Kennedy Meadows in Tulare Co.; Tehachapi; W end Big Bear Lake (Cowan, 1936: 234, map); Orange County (*op. cit.*: 211); Casitas Pass; Salmon Creek, Monterey Co.; Alviso Canyon; Tejon Ranch; Greenhorn Mtn.; Dunlap; South Fork, Merced River; near Bloods, Calaveras Co.

Dama hemionus cerrosensis (Merriam)

1898. *Odocoileus cerrosensis* Merriam, Proc. Biol. Soc. Washington, 12:101, April 30, type from Cerros [= Cedros] Island, off W coast Baja California. Known only from Cedros Island, Baja California.

1915. *Odocoileus hemionus cerrosensis*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4: 180.

Dama hemionus columbiana (Richardson)

1829. *Cervus macrotis* var. *Columbiana* Richardson, Fauna Boreali-Americana, 1:257. Type locality, mouth of Columbia River, Oregon (= Cape Disappointment, Pacific Co., Washington; see Cowan, California Fish and Game, 22:218–219, July, 1936).

1936. *Odocoileus hemionus columbianus*, Cowan, California Fish and Game, 22:215, July.

1848. *Cervus Lewisii* Peale, Mammalia and ornithology, *in* U. S. Explor. Exped. . . . , p. 39, applied to specimens from Feather River and San Francisco Bay, California.

1852. *Cariacus punctulatus* Gray, Proc. Zool. Soc. London, p. 239, for 1850, January 24. Type locality, California.

1853. *Cervus Richardsoni* Audubon and Bachman, The viviparous quadrupeds of North America, 3:27. Type locality, California.

1873. *Eucervus pusilla* Gray, Hand-list of the edentate, thick-skinned, and ruminant mammals in the British Museum, p. 157. Type locality, North America [= British Columbia?].

1898. *Odocoileus columbianus scaphiotus* Merriam, Proc. Biol. Soc. Washington, 12:101, April 30, type from Laguna Ranch, Gabilan Range, San Benito Co., California. (Regarded as indistinguishable from *columbianus* by Cowan, California Fish and Game, 22:215, July, 1936.)

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:368): Rivers Inlet; Pemberton Meadows; Boston Bar; upper Skagit Valley. Washington: *summit of Cascades westward* (Dalquest, 1948:403). California: E side Mt. Shasta (Grinnell, 1933:206); Eagle Lake (Cowan, 1936: 219); Lake Tahoe (*op. cit.*: 224); Pigeon Roost Camp (*ibid.*); Chinquapin (*ibid.*); Elkhorn Station, Yolo Co. (*ibid.*); Fourteen Mile House (*ibid.*); Laguna Ranch, Gabilan Range (*ibid.*); near Coalinga (*op. cit.*: 234, map), thence northward along coast, including Vancouver Island, to point of beginning.

Dama hemionus crooki (Mearns)

1897. *Dorcelaphus crooki* Mearns, Preliminary diagnoses of new mammals of the genera *Mephitis, Dorcelaphus,* and *Dicotyles,* from the Mexican border . . . , p. 2, February 11 (preprint of Proc. U.S. Nat. Mus., 20:468, December 24, 1897), type from summit Dog Mtns., 6129 ft., Hidalgo Co., New Mexico. Regarded as a hybrid by Seton, Lives of game animals . . . , vol. 3:327–328, 1929, and Goldman and Kellogg, Jour. Mamm., 20:507, November 14, 1939.

Map 490. *Dama hemionus.*

Guide to subspecies
1. *D. h. californica*
2. *D. h. cerrosensis*
3. *D. h. columbiana*
4. *D. h. crooki*
5. *D. h. eremica*
6. *D. h. fuliginata*
7. *D. h. hemionus*
8. *D. h. inyoensis*
9. *D. h. peninsulae*
10. *D. h. sheldoni*
11. *D. h. sitkensis*

1939. *Odocoileus hemionus crooki*, Goldman and Kellogg, Jour. Mamm., 20:507, November 14.
1901. *Odocoileus hemionus canus* Merriam, Proc. Washington Acad. Sci., 3:560, November 29, type from Sierra en Media, Chihuahua.

MARGINAL RECORDS.—Arizona: Colorado Canyon between Cataract Creek and Pine Springs (Mearns, 1907:198); San Francisco Mts. (*op. cit.*:197); Bakers Butte, Mogollon Mts. (*op. cit.*:194). New Mexico: ¾ mi. S Madre Mtn. (41372 KU); 15 mi. W Magdalena (Longhurst and Chattin, 1941:11); Hell Canyon, Manzano Mts. (*ibid.*); San Andres Mts. (V. Bailey, 1932:34); Dark Canyon, Guadalupe Mts. (16543 KU). Texas (V. Bailey, 1905:65–66): Washburn; Mobeetie; Castle Mts.; Fort Lancaster; mouth of Pecos River. Coahuila: *southwestern Coahuila* (Leopold, 1947:442, map). Zacatecas: *northern Zacatecas* (*ibid.*). Durango: *northeastern Durango* (*ibid.*). Chihuahua: Sierra en Media (Merriam, 1901:560). Sonora: San Bernardino Valley (Burt, 1938:72). Arizona: Woods Ranch (20 mi. SW Tucson) (Mearns, 1907:198); Squaw Peak (10 mi. N Phoenix) (*ibid.*); near Prescott, Lynch Creek (*ibid.*).

Dama hemionus eremica (Mearns)

1897. *Dorcelaphus hemionus eremicus* Mearns, Preliminary diagnoses of new mammals of the genera *Mephitis*, *Dorcelaphus*, and *Dicotyles* from the Mexican border . . . , p. 4, February 11 (preprint of Proc. U.S. Nat. Mus., 20: 470, December 24, 1897), type from Sierra Seri, near Gulf of California, Sonora.
1902. *Dama h[emionus]. eremica*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:20, February 1.

MARGINAL RECORDS.—California: vicinity of Coxcomb Mtn. (Grinnell, 1933:208). Arizona: Colorado River opposite Blythe (Longhurst and Chattin, 1941:11); valley of the Ajo (Huey, 1942:362). Sonora: Pozo de Luis (Burt, 1938:72); La Libertad Ranch (*ibid.*). Baja California: delta of Colorado River (Stone, 1905:680). California: Indio (Grinnell, 1933:208).

Dama hemionus fuliginata (Cowan)

1933. *Odocoileus hemionus fuliginatus* Cowan, Jour. Mamm., 14:326, November 13, type from Barona Ranch, 30 mi. E San Diego, San Diego Co., California.

MARGINAL RECORDS.—California: Tahquitz Valley (Longhurst and Chattin, 1941:11); Toro Peak, Santa Rosa Mts. (Cowan, 1936:232). Baja California: Hanson Lagoon, Laguna Hanson Mts. (Elliot, 1903:207); Parral (*ibid.*); Mission Santa María (Cowan, 1936:232); San Quentín (Elliot, 1903:206). California: San Mateo Valley, Orange Co. (Cowan, 1936:232).

Dama hemionus hemionus (Rafinesque)

1817. *Cervus hemionus* Rafinesque, Amer. Monthly Mag., 1:436, October. Type locality, mouth of Big Sioux River, South Dakota (see V. Bailey, N. Amer. Fauna, 49:41, January 8, 1927).
1902. *Dama hemionus*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:20, February 1.
1820. *Cervus auritus* Warden, Description . . . des États-Unis . . . , 5:640. Type locality, ". . . la contrée située à l'ouest des montagnes Rocky, près des bords de la rivière de Kooskooskée."
1823. *Cervus macrotis* Say, *in* Long, Account of an exped. . . . to the Rocky Mountains . . . , 2:88. Type locality, Mora River, near present town of Mora, New Mexico.
1881. *Cervus macrotis* var. *Montanus* Caton, Antelope and deer of America, ed. 2, p. 94. Type locality, lat. 42° on Missouri River.
1899. *Cariacus virgultus* Hallock, Forest and Stream, 52 (21):404, May 27. Type locality, near Hallock, Kittson Co., Minnesota.

MARGINAL RECORDS.—Mackenzie District: Simpson (Anderson, 1947:175); W end Great Slave Lake (*ibid.*). Alberta: Wood Buffalo Park (Rand, 1948b:209). Manitoba: Spruce Woods Forest Reserve (Soper, 1946:151); near town of Sprague (Swanson, 1945:99). Minnesota: Zippel Township, Lake of the Woods Co. (*ibid.*); 25 mi. NE Grand Rapids (Peterson, 1954:??—Minneapolis Sunday Tribune); near Pillager (Gunderson and Beer, 1953:176); on U.S. Highway 10, near Valentine Lake (Erickson and Bue, 1954: 457). Kansas: *western ⅔ of state* (Cockrum, 1952:272). New Mexico: northern escarpment Staked Plains (V. Bailey, 1932:29); Sacramento Mts. (*ibid.*); Manzano Mts. (*ibid.*); Gallinas Mtn. (*op. cit.*:31); W of Chloride (*op. cit.*:32); along Gila River (*ibid.*); Mogollon Mts. (*op. cit.*:29). Arizona: Grand Canyon (V. Bailey, 1935:5, as *O. h. macrotis*). Nevada (Hall, 1946:628): Bonelli Peak; Charleston Peak;

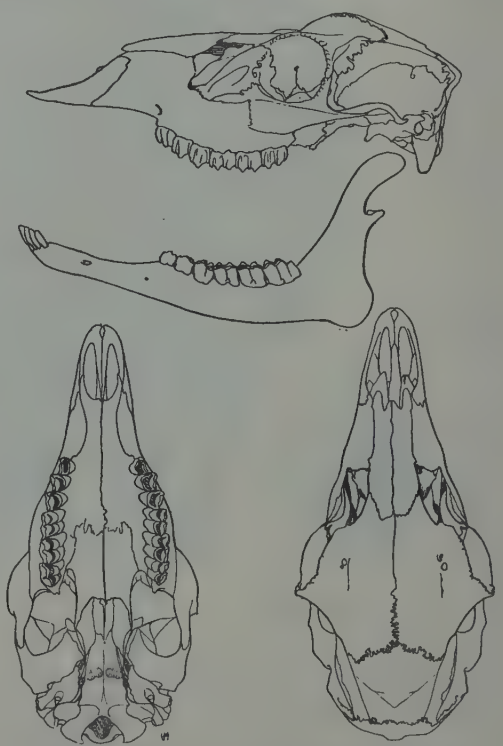


Fig. 528a. *Dama hemionus hemionus*, 12-mile Creek, Nevada, ¾ mi. E California boundary, No. 74295 M.V.Z., ♀, X ¾.

Grapevine Peak. California (Cowan, 1936:210): Tuolumne Meadows; Dardanelles; Pigeon Roost Camp; Charles Meadows; Buck Butte; Red Rock Valley. Washington: Yakima Park (Potts and Grater, 1949:19). British Columbia: near Lillooet (Cowan, 1936:210); Quesnel (*ibid.*); Lower Liard Crossing (Anderson, 1947:175).

Fig. 528b. Right antlers of deer, viewed from inside, to show difference between antler of Black-tailed Deer, *a*, and White-tailed Deer, *b*. Note that the antler of the White-tailed Deer (*b*) has one main beam with minor prongs branching off of the same whereas the antler of the Black-tailed Deer (*a*) branches into two nearly equal parts. X approximately ⅙.

Dama hemionus inyoensis (Cowan)

1933. *Odocoileus hemionus inyoensis* Cowan, Proc. Biol. Soc. Washington, 46:69, April 27, type from Kid Mtn., 11,000 ft., 10 mi. W Big Pine, Inyo Co., California.

MARGINAL RECORDS.—California (Cowan, 1936:229): Piute Monument, White Mts.; *Poison Creek, White Mts.; Black Mtn., Inyo Mts.*; Badger Flat, Inyo Mts.; Sawtooth Peak; *George Creek, NE Mt. Bernard* [= *Barnard*]; *S. Kearsarge Peak; 7 mi. W Independence; type locality*; Bishop Creek Canyon.

Dama hemionus peninsulae (Lydekker)

1898. *Mazama* (*Dorcelaphus*) *hemionus peninsulae* Lydekker, Proc. Zool. Soc. London, for 1897, pp. 899–900, April, type from between La Laguna and Victoria Mtn., about 6000 ft., Sierra Laguna, Baja California (see Cowan, California Fish and Game, 22:232, July, 1936).

1902. *Dama h[emionus]. peninsulae*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:20, February 1.

MARGINAL RECORDS.—Baja California: Santa Teresa Bay (Cowan, 1936:235); Cape San Lucas (*ibid.*); San Bartolomé Bay (Townsend, 1912:119).

Dama hemionus sheldoni (Goldman)

1939. *Odocoileus hemionus sheldoni* Goldman, Jour. Mamm., 20:497, November 15, type from Tiburón Island, Sonora. Known only from Tiburón Island, Sonora.

Dama hemionus sitkensis (Merriam)

1898. *Odocoileus columbianus sitkensis* Merriam, Proc. Biol. Soc. Washington, 12:100, April 30, type from Sitka, Alaska.

1936. *Odocoileus hemionus sitkensis*, Cowan, California Fish and Game, 22:224, July.

MARGINAL RECORDS (Anderson, 1947:176, unless otherwise noted). Yukon: Nisultin River. British Columbia: Atlin; Port Simpson; Porcher Island (Cowan and Guiguet, 1956:372); Bella Bella (*ibid.*); Calvert Island (*ibid.*). Alaska: Duke Island (Swarth, 1911:113); Dall Island (*ibid.*); Egg Harbour, Coronation Island (*ibid.*); type locality; Indian Island, Icy Straits. Yukon: Little Atlin section. Introduced on *Graham Island* and *Moresby Island*, British Columbia (Osgood, 1901:25).

Dama virginiana
White-tailed Deer

External measurements: 1340–2062; 152–330; 362–521; 140–229; height at shoulder, 660–1143. Weight, 50–350 lbs. Condylobasal length, 242.3–290; length of maxillary tooth-row, 68.0–88.5; width of orbit at frontojugal suture, 102.8–123.5. Females average smaller than males. Upper parts (summer) bright fulvous chestnut to gray, grayer in winter; underparts white, lower surface of tail, chin, throat, band around muzzle, and ring around eye, white; young spotted. Antlers with long sub-basal snag, beam curving forward, with posterior prong upright, unbranched; prongs all appearing to arise vertically from main beam and generally are unbranched.

White-tailed deer inhabit woodlands, forest edges, and thickets along streams, seemingly avoiding dense stands of conifers or extensive open places. They tolerate the presence of man and are found in considerable numbers on the edges of some of the larger cities and near farms. The breeding season is in November in the north, earlier in the south, and 2 fawns (1–4) are born after a gestation period of about 6½ months.

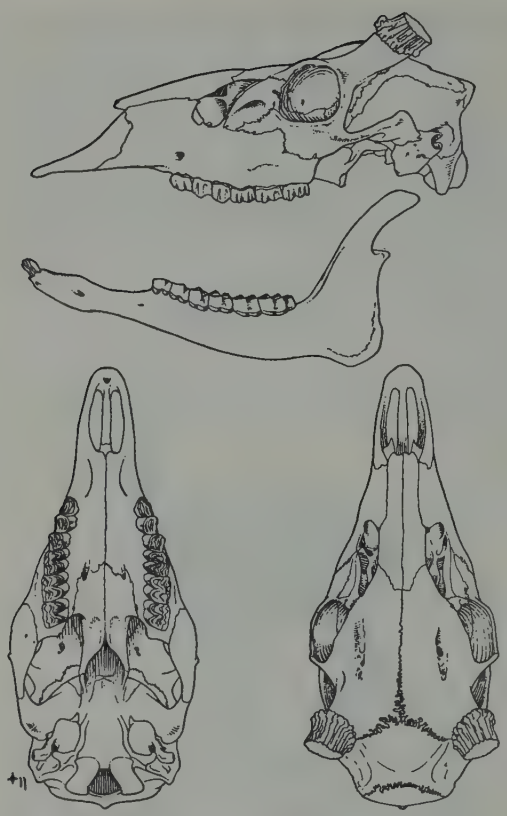


Fig. 529. *Dama virginiana texana*, Encinal, La Salle Co., Texas, No. 16538 K.U., ♂, X ¼.

Dama virginiana acapulcensis (Caton)

1877. *Cervus acapulcensis* Caton, The antelope and deer of America, p. 113. Type locality, Acapulco, Guerrero.
1915. *Odocoileus virginianus acapulcensis*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:159, 167.

MARGINAL RECORDS (Miller and Kellogg, 1955:807).—Colima: Armería. Oaxaca: Tehuantepec.

Dama virginiana borealis (Miller)

1900. *Odocoileus americanus borealis* Miller, Bull. New York State Mus. Nat. Hist., 8:83, November 21, type from Bucksport, Hancock Co., Maine.
1902. *Dama v[irginiana]. borealis*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:20, February 1.

MARGINAL RECORDS (Miller and Kellogg, 1955:802, unless otherwise noted).—Ontario: Newpost, Abitibi River. Quebec: Anticosti Island; *Gaspé Peninsula. New Brunswick. Cape Breton Island* (Anderson, 1947:176). *Nova Scotia*, thence southward along coast to Pennsylvania: Adams County (Rhoads, 1903:26). Maryland: Cumberland (Barbour and Allen, 1922:69), thence along north shore of Ohio River and then northward along east shore of Mississippi River to Wisconsin: Richland County (Cory, 1912:65, map). Minnesota: near Becker (B. Bailey, 1929:164).

Dama virginiana carminis (Goldman and Kellogg)

1940. *Odocoileus virginianus carminis* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:81, June 28, type from Botellas Cañon, 6500 ft., Sierra del Carmen, Coahuila.

MARGINAL RECORDS.—Texas: near Moss Well, 5400 ft. (Borell and Bryant, 1942:41). Coahuila: type locality; *10 mi. NW Las Margaritas, 3800 ft.* (56531 KU); 4 mi. E Las Margaritas, 4000 ft. (37827 KU); 4 mi. N, 21 mi. W Quatro Ciénegas, 6500 ft. (49635 KU); Jaral (Baker, 1956: 323); 26 mi. W Santa Teresa, 7050 ft. (45055 KU); Sierra del Pino, 7925 ft., 5 mi. N, 9 mi. W Acebuches (49637 KU). Texas: *Burro Mesa* (Borell and Bryant, 1942:42).

Dama virginiana chiriquensis (J. A. Allen)

1910. *Odocoileus rothschildi chiriquensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 28:95, April 30, type from Boquerón, Chiriquí, Panamá.
1915. *Odocoileus virginianus chiriquensis*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:158, 172.

MARGINAL RECORDS.—Panamá: Bayano River (Miller and Kellogg, 1955:808); type locality.

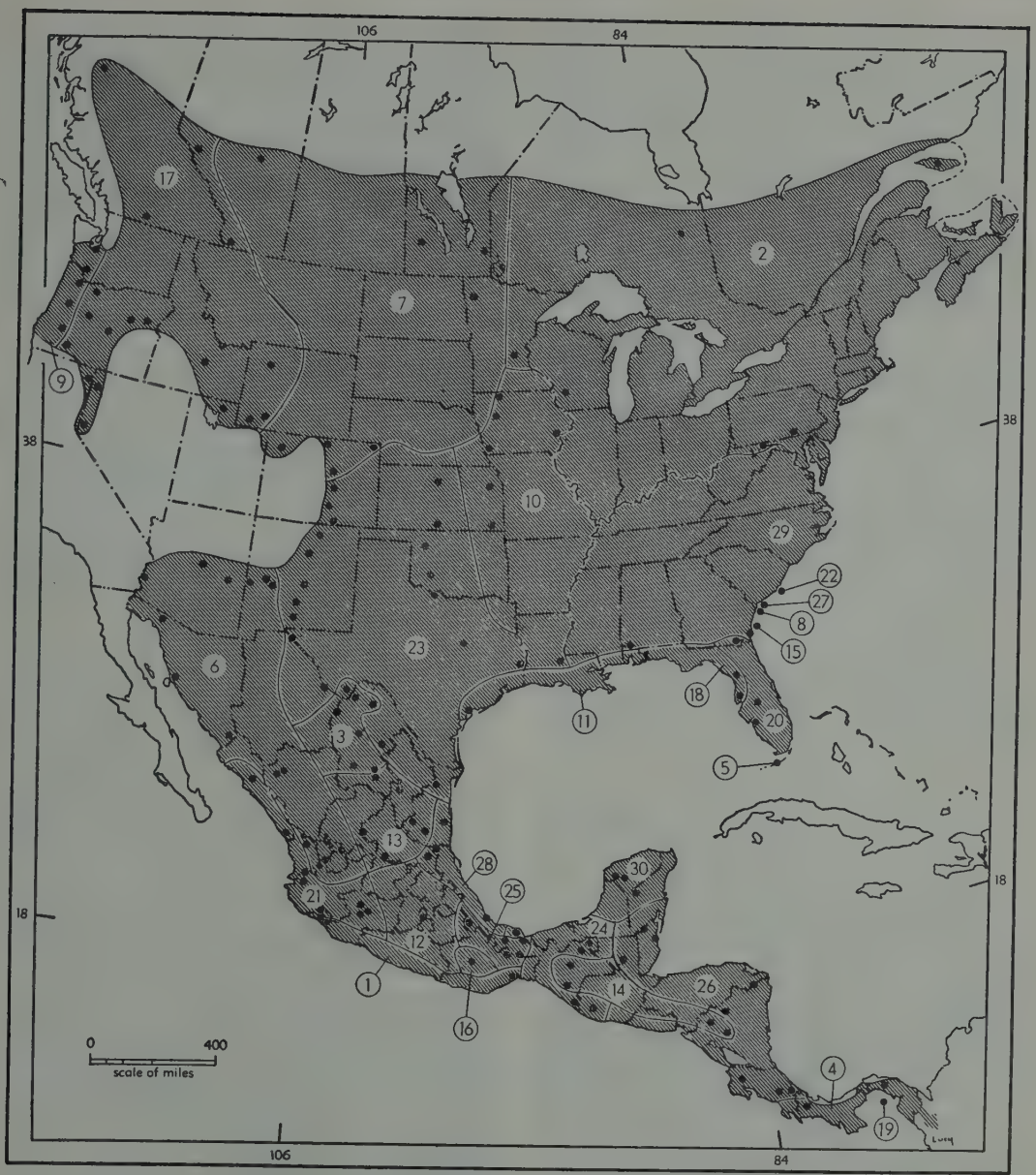
Dama virginiana clavia (Barbour and G. M. Allen)

1922. *Odocoileus virginianus clavium* Barbour and G. M. Allen, Jour. Mamm., 3:73, May 9, type from Big Pine Key, Monroe Co., Florida. Known only from the Florida Keys.

Dama virginiana couesi (Coues and Yarrow)

1875. *Cariacus virginianus* var. *couesi* Coues and Yarrow, Report upon the collections of mammals, p. 111, *in* Rept. Geogr. Geol. Explor. and Surv., West of One Hundredth Merid. (Wheeler), 5(Zool.):72, type from Camp Crittenden [= Crittenden], on Sonoita Creek, between Santa Rita and Patagonia Mts., Santa Cruz Co., Arizona.
1915. *Odocoileus virginianus couesi*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:158, 164.
1903. *Odocoileus battyi* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:591, November 12, type from Rancho Santuario, an old "Spanish Grant" ranch on the plains, 7000 ft., Durango.
1915. *O[docoileus]. v[irginianus]. baileyi* Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:158, an accidental renaming of *O. battyi*.

MARGINAL RECORDS (Miller and Kellogg, 1955:803, unless otherwise noted).—Arizona: Mogollon Mesa; between Black River and Ash Creek (Mearns, 1907:181). New Mexico (V. Bailey, 1932:36): San Francisco Mts.; Datil Mts.; Gallinas Mts. Durango: Rancho Santuario, 7000 ft. (J. A. Allen, 1903:591). Zacatecas: Plateado. Jalisco: near Bolaños. Nayarit: Santa Teresa. Durango: Guanaceví (J. A. Allen, 1904:205). Sonora (Burt, 1938:73): El Cobre; Sierra Seri; Sierra Cubabi. Arizona: Ehrenberg.



Map 491. *Dama virginiana.*

Guide
to subspecies

1. *D. v. acapulcensis*
2. *D. v. borealis*
3. *D. v. carminis*
4. *D. v. chiriquensis*
5. *D. v. clavia*
6. *D. v. couesi*
7. *D. v. dacotensis*
8. *D. v. hiltonensis*
9. *D. v. leucura*
10. *D. v. macroura*
11. *D. v. mcilhennyi*
12. *D. v. mexicana*
13. *D. v. miquihuanensis*
14. *D. v. nelsoni*
15. *D. v. nigribarbis*
16. *D. v. oaxacensis*
17. *D. v. ochroura*
18. *D. v. osceola*
19. *D. v. rothschildi*
20. *D. v. seminola*
21. *D. v. sinaloae*
22. *D. v. taurinsulae*
23. *D. v. texana*
24. *D. v. thomasi*
25. *D. v. tolteca*
26. *D. v. truei*
27. *D. v. venatoria*
28. *D. v. veraecrucis*
29. *D. v. virginiana*
30. *D. v. yucatanensis*

Dama virginiana dacotensis (Goldman and Kellogg)

1940. *Odocoileus virginianus dacotensis* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:82, June 28, type from White Earth River, Mountrail Co., North Dakota.

MARGINAL RECORDS.—Alberta: Edmonton (Miller and Kellogg, 1955:802). Manitoba: Riding Mts. (*ibid.*); Whiteshell Forest Reserve (Soper, 1946:151). Minnesota: Marshall County (Swanson, 1945:99). Nebraska: *Platte River* (Miller and Kellogg, 1955:802). Colorado: near Julesberg (Hunter, 1948:1); Denver (Miller and Kellogg, 1955:802); Larimer County (Warren, 1906:237); South Fork of White River (Miller and Kellogg, 1955:802). Wyoming: *east of mountains* (*ibid.*). Montana: *east of mountains* (*ibid.*).

Dama virginiana hiltonensis (Goldman and Kellogg)

1940. *Odocoileus virginianus hiltonensis* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:83, June 28, type from Hilton Head Island, Beaufort Co., South Carolina. Known only from Hilton Head Island.

Dama virginiana leucura (Douglas)

1829. *Cervus leucurus* Douglas, Zool. Jour., 4:330, October–January, 1829. Type locality, Lower Columbia River [= Willamette River Valley]; see V. Bailey, Proc. Biol. Soc. Washington, 45:44, April 2, 1932.
1915. *Odocoileus virginianus leucurus*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4: 158, 162.

MARGINAL RECORDS.—Washington: Steilacoom (Cowan, 1936:202); Cowlitz River (*ibid.*). Oregon: foothills about Beaverton (*op. cit.*:203); near Sweet Home (*ibid.*); near headwaters Umpqua River (V. Bailey, 1936:90).

Dama virginiana macroura (Rafinesque)

1817. *Corvus* [*sic*] *macrourus* Rafinesque, Amer. Monthly Mag., 1:436, October. Type locality, "Plains of the Kangar [= Kansas] River" [= plains near Wakarusa Creek, Douglas Co., Kansas].
1902. *Dama v*[*irginiana*]. *macroura*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:20, February 1.
1901. *Odocoelus virginianus louisianae* G. M. Allen, Amer. Nat., 35(414):449, June, type from Mer Rouge, Morehouse Parish, Louisiana.

MARGINAL RECORDS.—Iowa (Scott, 1937:83): Dickinson County; Muscatine County, thence southward along W bank Mississippi River to Louisiana: along Atchafalaya River (Lowery, 1936:32). Texas: *NE Texas* (Miller and Kellogg, 1955:804). Oklahoma: *E Oklahoma* (*ibid.*). Kansas: Chetopa (Cockrum, 1952:273); type locality. Iowa (Scott, 1937:83): McPaul; Sac County.

Dama virginiana mcilhennyi (F. W. Miller)

1928. *Odocoileus virginianus mcilhennyi* F. W. Miller, Jour. Mamm., 9:57, February 9, type from near Avery Island, Iberia Parish, Louisiana.

MARGINAL RECORDS.—Louisiana: *Pearl River* (Miller and Kellogg, 1955:804), thence westward along Gulf Coast to Texas: near Matagorda Bay (*ibid.*).

Dama virginiana mexicana (Gmelin)

1788. [*Cervus*] *mexicanus* Gmelin, Syst. nat., ed. 13, 1:179. Type locality, Valley of Mexico, México; see Osgood, Proc. Biol. Soc. Washington, 15:88, April 25, 1902, and Jour. Mamm., 1:77, March 2, 1920.
1915. *Odocoileus virginianus mexicanus*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:158, 165.
1902. *Dama lichtensteini* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:20, February 1, a renaming of *Cervus mexicanus* Lichtenstein.

MARGINAL RECORDS (Miller and Kellogg, 1955:806). —*Guanajuato. Puebla. Morelos.* Distrito Federal: Tlalpan.

Dama virginiana miquihuanensis (Goldman and Kellogg)

1940. *Odocoileus virginianus miquihuanensis* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:84, June 28, type from Sierra Madre Oriental, 6000 ft., near Miquihuana, Tamaulipas.

MARGINAL RECORDS.—Coahuila: Sierra Guadalupe (Goldman and Kellogg, 1940:85). Nuevo León: Cerro Potosí (Koestner, 1941:14). Tamaulipas: type locality; Pano Ayuctle (Goodwin, 1954:16); *San Antonio, 11 km. SW La Joya de Salas* (*ibid.*). San Luis Potosí: mountains near Jesús María (Miller and Kellogg, 1955:806); Bledos (Dalquest, 1953b:210).

Dama virginiana nelsoni (Merriam)

1898. *Odocoileus nelsoni* Merriam, Proc. Biol. Soc. Washington, 12:103, April 30, type from San Cristóbal, 8500 ft., Chiapas.
1915. *Odocoileus virginianus nelsoni*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4: 159, 168.

MARGINAL RECORDS.—Chiapas: type locality. *Guatemala* (Miller and Kellogg, 1955:807). Nicaragua: Rafael del Norte (J. A. Allen, 1910:95); Muy Muy (*ibid.*). *El Salvador* (Miller and Kellogg, 1955:807). Chiapas: Nueva Palestina, 846 m., 6 km. S Jaltenango (Villa, 1949:524).

Dama virginiana nigribarbis (Goldman and Kellogg)

1940. *Odocoileus virginianus nigribarbis* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:85, June 28, type from Blackbeard Island, McIntosh Co., Georgia.

MARGINAL RECORDS.—Georgia: *Sapelo Island* (Miller and Kellogg, 1955:804); type locality.

Dama virginiana oaxacensis (Goldman and Kellogg)

1940. *Odocoileus virginianus oaxacensis* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:85, June 28, type from mountains 15 mi. W Oaxaca, Oaxaca.

MARGINAL RECORDS.—Oaxaca: Cerro San Felipe (Miller and Kellogg, 1955:806); *type locality.*

Dama virginiana ochroura (V. Bailey)

1932. *Odocoileus virginianus ochrourus* V. Bailey, Proc. Biol. Soc. Washington, 45:43, April 2, type from Coolin, S end Priest Lake, Bonner Co., Idaho.
1933. *Odocoileus virginianus ochrurus*, V. Bailey, Nature Mag., 21(3):126, a *lapsus.*

MARGINAL RECORDS.—British Columbia: Babine Mts. (Miller and Kellogg, 1955:802). Alberta: Jasper (*ibid.*); Waterton Lakes National Park (Anderson, 1947:177). Montana: *W Montana* (Miller and Kellogg, 1955:802). Wyoming (*ibid.*): Valley; Green River; Fort Bridger. Utah: N of Ogden (*ibid.*). Idaho: Mackay (Davis, 1939:370). Oregon (V. Bailey, 1936:92): Powder River Valley; Buck Creek, Grant Co.; Davis Creek, Crook Co. Nevada: Granite Peak (Hall, 1946:623); Verdi, Truckee River (Miller and Kellogg, 1955:802). California: head South Fork Pit River (Cowan, 1936:201). Oregon: Fort Klamath (V. Bailey, 1936:93); Metolius River, W of Deschutes River (*op. cit.*: 92); Mill Creek, NE Base Mt. Hood (*ibid.*). British Columbia: vicinity Penticton (Cowan, 1936:200).

Dama virginiana osceola (Bangs)

1896. *Cariacus osceola* Bangs, Proc. Biol. Soc. Washington, 10:26, February 25, type from Citronelle, Citrus Co., Florida.
1902. *Dama v[irginiana]. osceola*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:20, February 1.
1896. *Cariacus* (or *Damelaphus*) *fraterculus* [Coues], The Nation, 62:404, May 21. Type locality, Florida. (Described by Cory, Hunting and fishing in Florida . . . , p. 113.)

MARGINAL RECORDS.—Mississippi: *Pearl River* (Miller and Kellogg, 1955:805); *S Mississippi* (*ibid.*). Alabama: *S Alabama* (*ibid.*). Florida: Blitches Ferry (Sherman, 1937: 123); N of Tampa Bay (Miller and Kellogg, 1955:805).

Dama virginiana rothschildi Thomas

1902. *Dama rothschildi* Thomas, Nov. Zool., 9:136, April 10, type from Coiba Island, Panamá. Known only from Coiba Island.
1915. *Odocoileus virginianus rothschildi*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:158, 171.

Dama virginiana seminola (Goldman and Kellogg)

1940. *Odocoileus virginianus seminolus* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:86, June 28, type from 10 mi. NE Everglades, Collier Co., Florida.

MARGINAL RECORDS.—Georgia: Okefenokee Swamp (Miller and Kellogg, 1955:805), thence along coast to Florida: Lee County (Hamilton, 1941:690); Lake Arbuckle (Sherman, 1937:123).

Dama virginiana sinaloae (J. A. Allen)

1903. *Odocoileus sinaloae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 19:613, November 14, type from Escuinapa, Sinaloa.
1915. *Odocoileus virginianus sinaloae*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4: 159, 166.

MARGINAL RECORDS.—Sinaloa: Culiacán (Miller and Kellogg, 1955:807). Michoacán (Hall and Villa, 1949:470): Nahuatzin, 8500 ft.; Pátzcuaro, 7000 ft.; Uruapan, 4500 ft. Colima: Paso del Río (Hooper, 1955:25). Jalisco (J. A. Allen, 1906:241): Volcán de Fuego; Wakenakili Mts.; Estancia. Sinaloa: type locality.

Dama virginiana taurinsulae (Goldman and Kellogg)

1940. *Odocoileus virginianus taurinsulae* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:87, June 28, type from Bulls Island, Charleston Co., South Carolina. Known only from Bulls Island.

Dama virginiana texana (Mearns)

1898. *Dorcelaphus texanus* Mearns, Proc. Biol. Soc. Washington, 12:23, January 27, type from Fort Clark [north of Eagle Pass on Big Bend of Rio Grande], Kinney Co., Texas.
1902. *Dama v[irginiana]. texensis* [*sic*], J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:20, February 1.
1901. *Odocoileus texensis* Miller and Rehn, Proc. Boston Soc. Nat. Hist., 30:17, December 27, an accidental renaming of *texanus*.

MARGINAL RECORDS (Miller and Kellogg, 1955:803, unless otherwise noted).—Nebraska: Republican River. Kansas (Cockrum, 1952:273): forks of Solomon River; Barber County. Oklahoma: Woodward County (Blair, 1939:130); Cache (*ibid.*); Beaver Creek, Texas-Oklahoma line (V. Bailey, 1905:63). Texas: McLennan County (Strecker, 1924:20); Jasper County (V. Bailey, 1905:61). Tamaulipas: El Mulato (Dice, 1937:256). Nuevo León: *northern Nuevo León*. Coahuila: Monclova. Chihuahua: Ojinaga. Texas: San Elizario. New Mexico: Sacramento Mts. (Dice, 1930: 27); *near Highrolls* (*ibid.*); Ruidoso (V. Bailey, 1932:35); Gallo Canyon, N of Jicarilla Mts. (*ibid.*); E side Pecos Baldy (*ibid.*); E slopes Taos Mts. (*ibid.*). Colorado: Fischer Peak area near Trinidad (Hunter, 1948:1); San Isabel National Forest region (*ibid.*); Black Forest region, N of Colorado Springs (Warren, 1942:248).

Dama virginiana thomasi (Merriam)

1898. *Odocoileus thomasi* Merriam, Proc. Biol. Soc. Washington, 12:102, April 30, type from Huehuetán, Chiapas.
1915. *Odocoileus virginianus thomasi*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4: 159, 168.

MARGINAL RECORDS.—Veracruz: Catemaco (Miller and Kellogg, 1955:807). Tabasco: Montecristo (*ibid.*). Chiapas: Palenque (*ibid.*). Guatemala: Finca Ciprés (Goodwin, 1934:57). Chiapas: type locality.

Dama virginiana tolteca (Saussure)

1860. *Cervus toltecus* Saussure, Revue Mag. Zool., Paris, ser. 2, 12:247. Type locality, near Orizaba, Veracruz.
1915. *Odocoileus virginianus toltecus*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:159, 167.

MARGINAL RECORDS.—Veracruz: type locality; Pasa Nueva (J. A. Allen, 1904:30); Mirador (Miller and Kellogg, 1955:806); 20 km. E Jesús Carranza, 200 ft. (24563 KU). Oaxaca: Achotal (Miller and Kellogg, 1955:806).

Dama virginiana truei (Merriam)

1889. *Cariacus clavatus* True, Proc. U.S. Nat. Mus., 11:417, July 5. Type from Segovia River, about 50 mi. from sea, Comarca de El Cabo, Nicaragua. Not Hamilton-Smith, 1827, unidentifiable.
1898. *Odocoileus truei* Merriam, Proc. Biol. Soc. Washington, 12:103, April 30, a renaming of *Cariacus clavatus* True.
1901. *Odocoileus costaricensis* Miller, Proc. Biol. Soc. Washington, 14:36, April 25, type from Talamanca region, E side Costa Rica, between coast and foot of Cordilleras, Costa Rica.

MARGINAL RECORDS.—British Honduras: Kate's Lagoon (Hershkovitz, 1951:568); Belize (Miller and Kellogg, 1955:808). Nicaragua: type locality. Costa Rica (Goodwin, 1946:448): Talamanca; Cartago; *Carillo*; Bebedero. Nicaragua: Río Coco (J. A. Allen, 1910:95). Guatemala: 7 mi. S La Libertad (Goodwin, 1955d:5).

Dama virginiana venatoria (Goldman and Kellogg)

1940. *Odocoileus virginianus venatorius* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:88, June 28, type from Hunting Island, Beaufort Co., South Carolina. Known only from Hunting Island.

Dama virginiana veraecrucis (Goldman and Kellogg)

1940. *Odocoileus virginianus veraecrucis* Goldman and Kellogg, Proc. Biol. Soc. Washington, 53:89, June 28, type from Chijol, 200 ft., Veracruz.

MARGINAL RECORDS.—Tamaulipas: Soto la Marina (Miller and Kellogg, 1955:806). Veracruz: near port of Veracruz (*ibid.*). San Luis Potosí (Dalquest, 1953b:210): 5 km. NE Pujal; Ebano.

Dama virginiana virginiana Zimmermann

1780. *Dama virginiana* Zimmermann, Geographische Geschichte . . . , 2:24, 129. Type locality, Virginia.
1919. *Cariacus wisconsinensis* Belitz, Wisconsin Conserv., 1:1, a renaming of *D. virginianus* Zimmermann.

MARGINAL RECORDS.—West Virginia: *northern boundary* (Miller and Kellogg, 1955:801). Virginia: *northern boundary* (*ibid.*). Georgia: Cumberland Island (Barbour and Allen, 1922:69). Alabama: Mount Vernon Barracks (*ibid.*). Mississippi: *southern Mississippi* (Miller and Kellogg, 1955:802), thence northward on W bank of Mississippi River and eastward on S bank of Ohio River.

Dama virginiana yucatanensis (Hays)

1872. *Cervus yucatanensis* Hays, Ann. Lyc. Nat. Hist., New York, 10(8):218, October–December. Type locality, Yucatán and S part México.
1946. *Odocoileus virginianus yucatanensis*, Goldman and Moore, Jour. Mamm., 26:360, February 12.

MARGINAL RECORDS: Yucatán: Calcehtok (Hatt, 1938:337); Yokat (*ibid.*). Quintana Roo: Esmerelda (Hatt and Villa, 1950:238).

Genus Mazama Rafinesque—Brockets

1817. *Mazama* Rafinesque, Amer. Monthly Mag., 1(5):363, September. Type, by subsequent designation (Merriam, Science, n. s., 1:208, February 22, 1895), *Mazama pita* Rafinesque [= *Moschus americanus* Erxleben].
1827. *Subulo* Hamilton-Smith, *in* Griffith, The animal kingdom . . . by the Baron Cuvier . . . , 5:318. Type not designated; included species were *Cervus rufus* Illiger, *C. simplicicornis* Illiger, and *C. nemorivagus* F. Cuvier.
1841. *Passalites* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, p. xxxiii, 140. Type, *Cervus nemorigavus* F. Cuvier [= *Cervus gouazoubira* Fischer].
1842. *Subula* Lesson, Nouveau tableau du règne animal . . . mammifères, p. 174, a renaming of *Subulo* Hamilton-Smith. Not *Subula* Schumacher, 1817, a mollusk.
1843. *Coassus* Gray, List of the . . . Mammalia in the . . . British Museum, p. 174. Type not designated; included species were *Cervus rufus* Illiger, and *C. nemorivagus* F. Cuvier.
1872. *Homelaphus* Gray, Catalogue of the ruminant Mammalia . . . in the British Museum, p. 90. Type, *Homelaphus inornatus* Gray [= *Moschus americanus* Erxleben].
1874. *Nanelaphus* Fitzinger, Sitzungsber. k. Akad. Wiss., Wien (for 1873), 68(1):360. Type, *Nanelaphus namby* Fitzinger [= *Cervus gouzaoubira* Fischer].
1874. *Doryceros* Fitzinger, Sitzungsber. k. Akad. Wiss., Wien (for 1873), 68(1):360. Type not designated; included species were *Cervus tschudii* Wagner, and *C. nemorivagus* F. Cuvier.

Size small; back arched; tail short; ears moderate; face elongated; facial glands small and exposed; toe-gland pits deep and triangular. Antlers simple spikes, less than half length of head. Skull resembles that of *Dama* but auditory bullae less inflated, facial profile more arched; upper border of orbits flat, nearly straight. Canines (deciduous ?) often present; molars sometimes with supplementary columns. Dentition, i. $\frac{0}{3}$, c. $\frac{0}{1}$ or $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$.

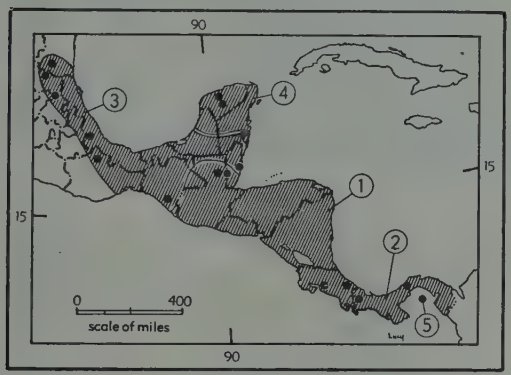
Brockets inhabit thick tropical forests and browse on leaves and green shoots. They are diurnal and extremely shy. In some parts of the range they seem to breed throughout the year, and the usual number of young is one or two.

KEY TO NORTH AMERICAN SPECIES OF MAZAMA

1. Upper parts some shade of rufous; underparts same color as flanks. *M. americana*, p. 1012
1′. Upper parts some shade of brown; underparts white. . . . . *M. gouazoubira*, p. 1013

Mazama americana
Red Brocket

External measurements: (♂) 1050–1350, 120; (♀) 1050–1420, 50–180. Condylobasal length, (♂) 177–210, (♀) 148–222; zygomatic breadth, (♂) 82–99, (♀) 70–100; length of maxillary tooth-row, (♂) 55–68, (♀) 48–73.5. Upper parts varying from yellowish rufous to dark chestnut rufous; midline and back of neck varying from dull brownish to black; legs pale rufous to black; underparts same color as flanks; hair of nape reversed in some; hair coarser than in the brown brocket. We know of no cranial characters that will distinguish the red from the brown brocket.



Map 492. *Mazama.*

Guide to kinds
1. *M. americana cerasina*
2. *M. americana reperticia*
3. *M. americana temama*
4. *M. gouazoubira pandora*
5. *M. gouazoubira permira*

Mazama americana cerasina Hollister

1914. *Mazama tema cerasina* Hollister, Proc. Biol. Soc. Washington, 27:209, October 31, type from Talamanca [= Sipurio, Río Sixaola, Limón, near Caribbean Coast], Costa Rica.
1951. *Mazama americana cerasina*, Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:567, July 10.

MARGINAL RECORDS.—Guatemala: Uaxactún (Murie, 1935:29). British Honduras: Mtn. Pine Ridge (*ibid.*), thence southward along coast to Costa Rica (Goodwin, 1946: 449): type locality; Pozo Azul, thence northward along Pacific Coast to Guatemala: *Pacific Coast region* (Handley, 1950:157).

Mazama americana reperticia Goldman

1913. *Mazama tema reperticia* Goldman, Smiths. Miscl. Coll., 60(22):2, February 28, type from Gatún, Canal Zone, Panamá.
1951. *Mazama americana reperticia*, Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:567, July 10.

MARGINAL RECORDS.—Panamá: Boquete (Goldman, 1920:80); type locality, thence eastward to South America.

Mazama americana temama (Kerr)

1792. *Cervus temama* Kerr, The animal kingdom . . . , p. 303. Type locality, restricted to Mirador, Veracruz, by Hershkovitz (Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:567, July 10, 1951).
1951. *Mazama americana temama*, Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:567, July 10.
1817. *Mazama tema* Rafinesque, Amer. Monthly Mag., 2(1):44, November, a renaming of *Cervus temama* Kerr.
1860. *C[ervus]. sartorii* Saussure, Revue et Mag. Zool., Paris, ser. 2, 12:252, June. Type locality, Mirador, Veracruz.

MARGINAL RECORDS.—Tamaulipas: Alta Cima (Goodwin, 1954:15), thence southward along coast to Campeche and eastward across southern part of Yucatán Peninsula to British Honduras: Bokowina (Hershkovitz, 1951:567). Chiapas: 1 km. S Finca Prusia, 1160 m. (Villa, 1949:527). Oaxaca: Playa de Carrizo, 30 km. (by road) W Tuxtepec (28279 KU). Veracruz: type locality. San Luis Potosí: Xilitla (Dalquest, 1953b:213); Platanito (*ibid.*).

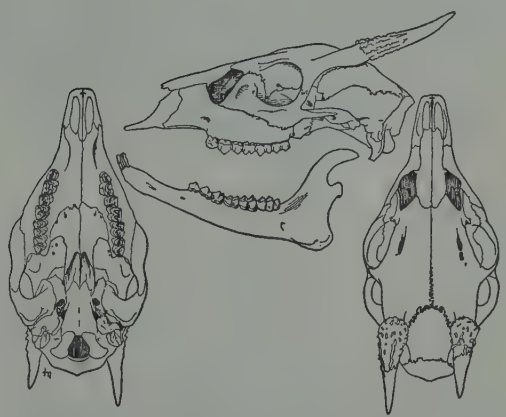


Fig. 530. *Mazama americana temama,* 35 km. SE Jesús Carranza, 400 ft., Veracruz, No. 24565 K.U., ♂, X ¾.

Mazama gouazoubira
Brown Brocket

External measurements: (♂) 1090–1200, 100–150; (♀) 980–1160, 100–120. Condylobasal length, (♂) 167–183, (♀) 165–180; zygomatic breadth, (♂) 77–86, (♀) 75–81.8; length of maxillary tooth-row, (♂) 50–61.5, (♀) 50.5–58.8. Upper parts varying from yellowish-gray brown to drab brown; underparts white; hair of nape never reversed; hair less coarse than in the red brocket.

Mazama gouazoubira pandora Merriam

1901. *Mazama pandora* Merriam, Proc. Biol. Soc. Washington, 14:105, July 19, type from Tunkás, Yucatán.
1951. *Mazama gouazoubira pandora*, Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:567, July 10.

MARGINAL RECORDS.—Yucatán: type locality; Chichén-Itzá (Hatt, 1938:337).

Mazama gouazoubira permira Kellogg

1946. *Mazama permira* Kellogg, Proc. Biol. Soc. Washington, 59:57, March 11, type from Isla San José, Archipelago de las Perlas, Golfo de Panamá, Panamá. Known only from Isla San José.
1951. *Mazama gouazoubira permira*, Hershkovitz, Fieldiana-Zool., Chicago Nat. Hist. Mus., 31:567, July 10.

Genus Alces Gray—Moose

Revised by Peterson, Contrib. Royal Ontario Mus. Zool. and Palaeo., 34:1–30, 8 figs., 1 table, October 15, 1952.

1821. *Alces* Gray, London Med. Repos., 15:307. Type, *Cervus alces* Linnaeus.
1841. *Alcelaphus* Gloger, Gemeinnütziges Hand- und Hilfsbuch der Naturgeschichte, p. 143, a renaming of *Alces* Gray. Not Blainville, 1816.
1902. *Paralces* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16: 160, a renaming of *Alces* Gray on the erroneous assumption that *Alces* Gray was a homonym of *Alce* Blumenbach, 1799 [= *Megaceros* Owen, 1844, a subgenus of *Cervus*].

Size large; body heavy; legs long; shoulder region high; tail short; muzzle broad and overhanging; ears large; neck short; dewlap present; nose with triangular bare spot between nostrils; antlers, present only in males, large, with palmate blades and projecting tines. Upper parts (new spring pelage) dark, varying from black to dark brown, reddish brown, or grayish brown; underparts and lower legs lighter, grayish or brownish, sometimes almost whitish; winter pelage grayer. Skull having premaxillary region greatly lengthened; nasals short, nasal aperture large; distance from front of nasal to front of premaxilla about equal to that from back of nasal to back of occiput; vomer low posteriorly, not dividing posterior nares into 2 chambers; lacrimal vacuity widely open, lacrimal pit well developed; maxillary canines usually absent in both sexes, lower canines incisiform; incisors little differentiated; molars and premolars broad and low crowned. Lateral metacarpals strongly attenuated, rudimentary, only distal ends developed as styloid vestiges. Metatarsal gland absent; hoofs long, narrow, pointed, forehoofs larger than hind hoofs (after Peterson, 1952:13–14). Dentition, i. $\frac{0}{3}$, c. $\frac{0}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$.

Alces alces
Moose

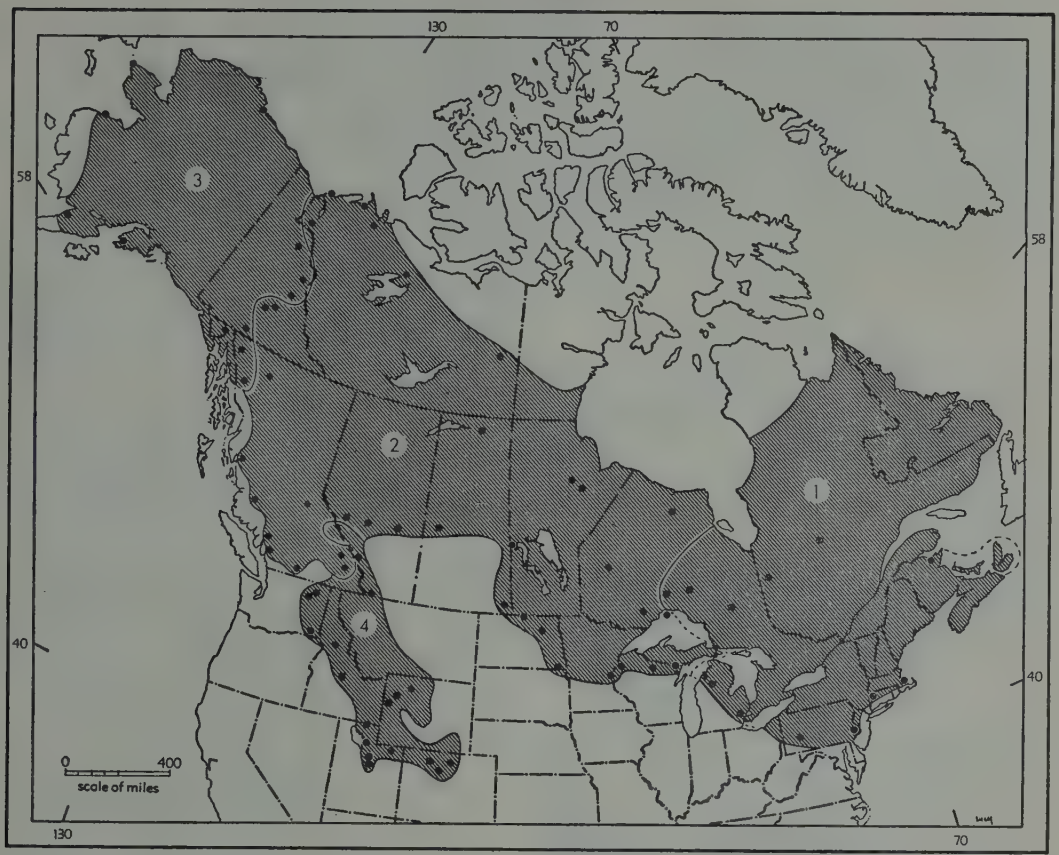
External measurements of a male from Quebec: 2903, 63, 792, 254; height at shoulder, 1826. Greatest length of skull, (♂) 521–686; mastoid breadth, (♂) 132–183; crown length of maxillary tooth-row, (♂) 136–162. Females average smaller than males. See characters of the genus.

Moose inhabit coniferous forests. They browse on conifers and the leaves of many deciduous trees and shrubs; bark is often eaten, and aquatic plants as well as grasses and sedges are much used as food. The breeding season is September and October, and the young, usually 2 (1–3), are born after a gestation period of 240–250 days.

Alces alces americana (Clinton)

1822. *Cervus americanus* [Clinton], Letters on the natural history and internal resources . . . of New York, p. 193. Type locality, "Country north of Whitestown" [probably in the western Adirondack region], New York.
1915. *Alces alces americana*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:234.
1907. *Alces columbae* Lydekker, The Field, London, 109: 182, February 2, type from Ontario (originally given as British Columbia, see Miller and Kellogg, Bull. U.S. Nat. Mus., 205:810, March 3, 1955). Regarded as indeterminable by Peterson, Occas. Papers Royal Ontario Mus. Zool., 9:6, May 25, 1950.

MARGINAL RECORDS.—Quebec: Mistassini Post (Cameron and Morris, 1951:129). New Brunswick: Nepisiquit (Peterson, 1952:28), thence along coast to Massachusetts: vicinity of Plymouth (Goodwin, 1935:175). Connecticut: Litchfield (Warfel, 1937:519). Pennsylvania (Goodwin, 1936:49): Northampton County; between Altoona and Pittsburgh. Michigan (Burt, 1946:260): Oakland County; Missaukee County. Ontario: 250 mi. NW Sault Ste. Marie



Map 493. *Alces alces.*

1. *A. a. americana* 2. *A. a. andersoni* 3. *A. a. gigas* 4. *A. a. shirasi*

(Peterson, 1952:29); Flint Lake, 35 mi. E Longlac (Peterson, 1952:27, as an intergrade with *andersoni*); 15 mi. S Kapuskasing (Peterson, 1952:29). Quebec: Fumerton Lake, 50 mi. NW Amos (*ibid.*).

Alces alces andersoni Peterson

1950. *Alces americana andersoni* Peterson, Occas. Papers Royal Ontario Mus. Zool., 9:1, May 25, type from sec. 27, T. 10, R. 16, Sprucewood Forest Reserve, 15 mi. E Brandon, Manitoba.

1952. *Alces alces andersoni* Peterson, Contrib. Royal Ontario Mus. Zool. and Palaeo., 34:24, October 15.

MARGINAL RECORDS.—Mackenzie: Ellice Island, mouth Mackenzie River (Preble, 1908:134); between head Eskimo Lakes and Liverpool Bay (Banfield, 1951:119); Wilmot Horton River, near 69° N (Preble, 1908:135); Dease River, NE Great Bear Lake (*ibid.*); Thelon River below junction with Hanbury (*ibid.*). Saskatchewan: Stone River, E end Athabaska Lake (*op. cit.*:134). Manitoba: Split Lake (Preble, 1902:43); Steel River, a few miles below Fox River (*ibid.*). Ontario: Shamattawa River (*ibid.*); Nungessor Lake (Peterson, 1952:27): 40 mi. NW Port Arthur (*ibid.*); Simpson Island (*ibid.*). Michigan: Dickinson County (Burt, 1946: 260). Wisconsin: Price County (Cory, 1912:77); Burnett County (*ibid.*). Minnesota: southern Pine County (Swanson, 1945:100). North Dakota: Sargent County (V. Bailey, 1927:32); around Devils Lake (*ibid.*); Turtle Mts. (*op. cit.*:31). Saskatchewan: Moose Mtn. (Soper, 1946:151). Manitoba: Overflowing River, N of lat. 53°, S of The Pas (Peterson, 1952:27). Saskatchewan: Birch Lake (*ibid.*). Alberta: Elk Island Park (*ibid.*); Brazeau River, 175 mi. NW Calgary (*ibid.*); between Smoky River and Jasper House (Hollister, 1912c:37). British Columbia (Cowan and Guiguet, 1956:379, unless otherwise noted): Indianpoint Lake; Golden; Invermere; Similkameen Valley; Squamish; Pemberton Meadows; Stuie; Kitimat (Munro, 1947:152); McDame Post, Dease River (Peterson, 1952:27). Yukon: Teslin River District (*ibid.*); Lapie River (Canol Road) mi. 120 (*ibid.*). Mackenzie: vicinity of Fort McPherson (Preble, 1908:133).

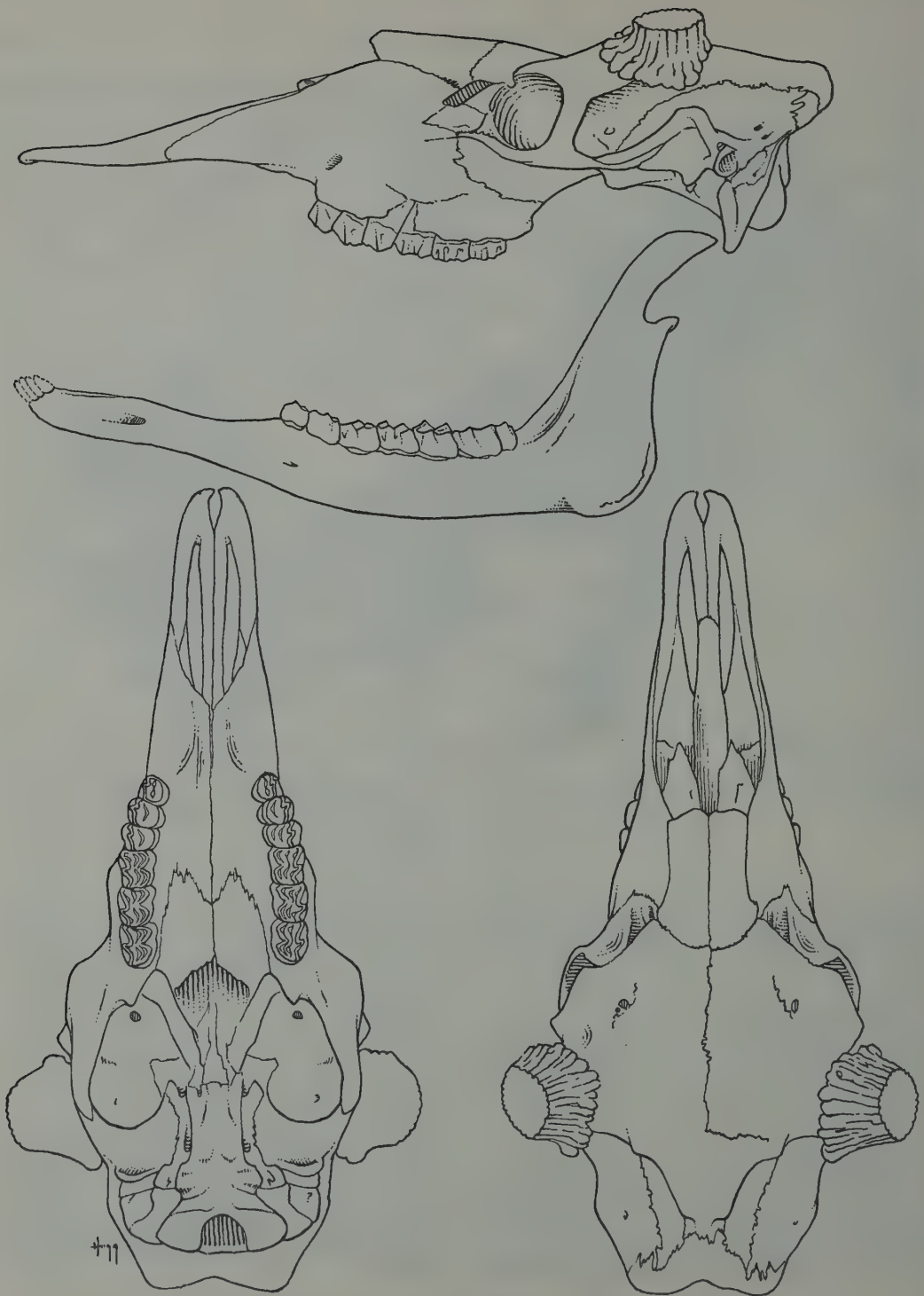


Fig. 531. *Alces alces andersoni*, Lake of the Woods, Marshall Co., Minnesota, No. 2477 K.U., ♂, X ¼.

Alces alces gigas Miller

1899. *Alces gigas* Miller, Proc. Biol. Soc. Washington, 13: 57, May 29, type from N side Tustumena Lake, Kenai Peninsula, Alaska.
1915. *Alces alces gigas*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:237.

MARGINAL RECORDS.—Alaska: mouth of Colville River (Rausch, 1951:185). Yukon: Peel River (Preble, 1908:134); upper waters of Stewart River (Osgood, 1900b:23); N fork Macmillan River (*ibid.*); Teslin River district (Peterson, 1952:23). British Columbia: Atlin (*ibid.*); Telegraph Creek (*op. cit.*:27, as an intergrade with *andersoni*); 15 mi. NW Kelsall Lake (Baker, 1951:116). Alaska: Chugachick Bay, Kenai Peninsula (Peterson, 1952:23); Katmai, Alaska Peninsula (Osgood, 1901:61); Yukon Delta (Osgood, 1900b:23); Cape Prince of Wales, Seward Peninsula (Brooks, 1953: 396).

Alces alces shirasi Nelson

1914. *Alces americanus shirasi* Nelson, Proc. Biol. Soc. Washington, 27:72, April 25, type from Snake River, 4 mi. S Yellowstone Park, Teton Co., Wyoming.
1952. *Alces alces shirasi*, Peterson, Contrib. Royal Ontario Mus. Zool. and Palaeo., 34:23, October 15.

MARGINAL RECORDS (Peterson, 1952:24, unless otherwise noted).—British Columbia: *Fraser River near Alberta line* (Hollister, 1912c:37). Alberta: Banff; Waterton. Montana: *upper Missouri River*. Wyoming: S Fort Shoshone River, near Cody; near Jackson; type locality. Colorado: head Burgess Creek, about 5 mi. E Steamboat Springs (Warren, 1942:288); Estes Park region (*ibid.*); Grand County. Utah (Durrant, 1952:462): Uinta Mts.; Spanish Fork Canyon; American Fork Canyon; near Kaysville; Lewiston. Idaho (Davis, 1939:371): Salmon River Mts.; Locksa River, Idaho Co. Washington: Blue Mts. (Dalquest, 1948:404); Twin Lakes, Ferry Co. (Scheffer and Dalquest, 1944:413); 3 mi. N Boyd's (*ibid.*). British Columbia: *Flathead Valley* (Cowan and Guiguet, 1956:380).

Genus Rangifer Hamilton-Smith—Reindeer and Caribou

Revised by Jacobi, Zool. Anzeiger, 96, suppl.: vii + 264, 32 figs., 6 pls., November, 1931. In the absence of definitive characters for the species of *Rangifer* and awaiting a modern revision of the genus, we follow Lydekker (Deer of all lands, Rowland Ward Ltd., London, pp. 33–49, 1898, and Catalogue ungulate mammals in the . . . British Museum, pp. 238–256, 1915) in arranging all forms as subspecies of *Rangifer tarandus*.

1827. *Rangifer* Hamilton-Smith, *in* Griffith, The animal kingdom . . . by the Baron Cuvier . . . , 5:304. Type, *Cervus tarandus* Linnaeus.
1827. *Tarandus* Billberg, Synopsis faunae Scandinaviae, p. 22. Type, *Cervus tarandus* Linnaeus.
1838. *Procerus* Serres, Essai sur les Cavernes à Ossements, ed. 3, p. 143. Type not designated; included species were *Cervus tarandus* Linnaeus and *Procerus caribaeus* Serres.
1840. *Procervus* Blainville, Comptes Rend. Acad. Sci. Paris, 11:392, a renaming of *Procerus* Serres.
1845. *Achlis* Reichenbach, Vollständigste Naturgeschichte . . . , Säugethiere, 3:12. Type, *Cervus tarandus* Linnaeus.

Size moderate; ears and tail short; muzzle wide, hairy; mane on neck; lateral hoofs functional; main hoofs broad, deeply cleft, almost circular when held together; tarsal glands present, metatarsal glands absent; antlers large, variable, with brow and bez tines, semi-palmate distally, usually present in both sexes. Lacrimal vacuity large, pit small; vomer high posteriorly, completely dividing posterior nares; orbital cavities not extended backward under bases of horn pedicles. Maxillary canine usually present in both sexes; lower incisors relatively small; posterior lobe of last molar small. Dentition, i. $\frac{0}{3}$, c. $\frac{1}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$.

Rangifer tarandus
Caribou and Reindeer

External measurements: 1369–2536, 102–218, 381–700. Height at shoulder, 680–1397. Weight, to 600 lbs. Females average approximately 10 per cent smaller than males. Length of skull, 295–435; occipitonasal length, 221–302; zygomatic breadth, 110–149; length of series of upper cheek-teeth, 84–98. Color varying from almost pure white to blackish brown; neck usually with white throat-fringe; rump patch white; white band above hoofs.

Caribou (native) and reindeer (introduced) are highly gregarious, although at some times of the year the herds are segregated sexually. They make periodic migrations, the reason for which is not clearly known. These animals feed on grasses and sedges, the leaves of willows and birches, but the preferred food seems to be lichens, which form the basis of their winter diet. The breeding season is September and October, and the young (1 or 2 per female) are born in May and June. The males shed

their antlers shortly after the rut, but the females do not lose theirs until the calving season.

Rangifer tarandus arcticus (Richardson)

1829. *Cervus tarandus* var. *arctica* Richardson, Fauna Boreali-Americana, 1:241. Type locality, Fort Enterprise, about 64° 30′ N, 113° W, Mackenzie.
1898. *Rangifer tarandus arcticus*, Lydekker, Deer of all lands, p. 47.

MARGINAL RECORDS.—Keewatin: *Boothia Peninsula* (Banfield, 1951: map facing p. 4); *Melville Peninsula* (Anderson, 1947:178). Franklin (Baffin Island): Baird Peninsula (Manning, 1943:50); NE Chorkbak Inlet (*ibid.*). Keewatin: *Mansel Island* (Banfield, 1951: map facing p. 4). Ontario: 65 mi. E Winisk (*ibid.*); Sachigo River area (de Vos and Peterson, 1951:335). Saskatchewan: Reindeer Lake (Anderson, 1947:178). Alberta: 10 mi. NE Fort McMurray (Banfield, 1951: map facing p. 4). Mackenzie: Taltson River (Soper, 1942:143); vicinity of Fort Norman (Banfield, 1951: map facing p. 4); *lower Mackenzie Valley* (Anderson, 1947:178). Franklin: *southern half Victoria Island* (Banfield, 1951: map facing p. 4).

Rangifer tarandus caboti G. M. Allen

1914. *Rangifer arcticus caboti*, G. M. Allen, Proc. New England Zool. Club, 4:104, March 24, type from 30 mi. N Nachvak, Labrador. Regarded as a distinct species by Jacobi, Zool. Anzeiger, 96, suppl., p. 108, November, 1931, and by Anderson, Bull. Nat. Mus. Canada, 102:180, January 24, 1947.
1915. *Rangifer tarandus caboti*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:251.
1915. *Tarandus rangifer labradorensis* Millais, *in* The gun at home and abroad . . . , p. 259. Type locality, ". . . horns brought into Nain, Davis Inlet, and Fort Chimo."

MARGINAL RECORDS.—Labrador: type locality; Belle Isle Strait (Jacobi, 1931:110). Quebec: Cape Jones, James Bay (*op. cit.*:111).

Rangifer tarandus caribou (Gmelin)

1788. [*Cervus tarandus*] *caribou* Gmelin, Syst. nat., ed. 13, 1:177. Type locality, eastern Canada [= Quebec].
1884. *Rangifer tarandus caribou*, True, Proc. U. S. Nat. Mus., 7:592, November 29.

MARGINAL RECORDS.—Quebec: region of Eastmain Mts. (Cameron and Morris, 1951:129). Labrador: [Black Bay] directly opposite Newfoundland (Bangs, 1899:16), thence southward along coast to *Nova Scotia* (Anderson, 1947:180). New Brunswick: Woodstock (J. A. Allen, 1894: 100). Maine: Mt. Katahdin region (Dutcher, 1903:65). New Hampshire: Connecticut Lakes (Goodwin, 1935:178). Vermont: *northern portion* (G. M. Allen, 1904:8). Michigan: Spitza Farm, near Minden City (Burt, 1942:214); Beaver Islands (*ibid.*). Wisconsin: near White River, Price Co. (Cory, 1912:81); near La Point (*ibid.*). Michigan: Isle Royale (Burt, 1946:263). Ontario: Rainy Lake (Anderson, 1947:180); Lake of the Woods area (*ibid.*).

Rangifer tarandus dawsoni Thompson-Seton

1900. *Rangifer dawsoni* Thompson-Seton, Ottawa Nat., 13: 260, February, type from Graham Island, Queen Charlotte Islands, British Columbia.
1915. *Rangifer tarandus dawsoni*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4: 251.

Fig. 532. *Rangifer tarandus grönlandicus*, Holsteinberg, Greenland, No. 2266 K.U., sex ?, X ¼.

Map 494. *Rangifer tarandus.*

1. *R. t. arcticus*
2. *R. t. caboti*
3. *R. t. caribou*
4. *R. t. dawsoni*
5. *R. t. eogroenlandicus*
6. *R. t. fortidens*
7. *R. t. granti*
8. *R. t. grönlandicus*
9. *R. t. montanus*
10. *R. t. osborni*
11. *R. t. pearyi*
12. *R. t. stonei*
13. *R. t. sylvestris*
14. *R. t. terraenovae*

MARGINAL RECORDS.—British Columbia, Graham Island (Cowan and Guiguet, 1956:385): type locality (close to Naden Harbour); *valley of the river running into Virgo Sound; near Frederick Island.* According to Cowan and Guiguet (1956:385), *dawsoni* was confined to the part of Graham Island west of Naden Harbour and may be extinct since no definite evidence of its presence has been recorded since about 1920.

Rangifer tarandus eogroenlandicus Degerbøl

1957. *Rangifer tarandus eogroenlandicus* Degerbøl, Acta Arctica, Fasc. 10:45, prior to August 16, type from head of Scoresby Sund, Greenland.

MARGINAL RECORDS (Degerbøl, 1957:59).—Greenland: Germanialand; Angmagssalik.

Rangifer tarandus fortidens Hollister

1912. *Rangifer fortidens* Hollister, Smiths. Miscl. Coll., 56(35):3, February 7, type from head of Moose Pass branch of Smoky River, Alberta.

1915. *Rangifer tarandus fortidens*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:251.

MARGINAL RECORDS.—Alberta: between Pinto Creek and "Nose Creek Mdws." (Soper, 1947:161); Thoral Creek (Carter, *in* Crowe, 1943:409, as *R. montanus*, here referred to *fortidens* on geographic grounds); near Banff (Rand, 1948b:214); type locality; "Two Lakes" (Soper, 1947:161).

Rangifer tarandus granti J. A. Allen

1902. *Rangifer granti* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:122, March 31, type from W end Alaska Peninsula, opposite Popof Island, Alaska.
1910. *Rangifer tarandus granti*, Ward, Records of big game, ed. 6, p. 85.

MARGINAL RECORDS.—Alaska: Chulitna River (Osgood, 1904:27); Clark Lake (*ibid.*); Unimak Island (Murie, 1935:80); Nushagak (Osgood, 1900b:23).

Rangifer tarandus grönlandicus (Borowski)

1780. *Cervus grönlandicus* Borowski, Gemeinnüzzige Naturgeschichte des Thierreichs . . . , 1(3):72. Type locality, Greenland.
1898. *Rangifer tarandus gröenlandicus*, Lydekker, Deer of all lands, p. 47.

MARGINAL RECORDS (Degerbøl, 1957:60–61).—Greenland: Marshall Bay; Godthaab.

Rangifer tarandus montanus Thompson-Seton

1899. *Rangifer montanus* Thompson-Seton, Ottawa Nat., 13(5):129, August, type from Illecillewaet watershed, near Revelstoke, Selkirk Range, British Columbia.
1901. *Rangifer tarandus montanus*, Lydekker, Great and small game of Europe . . . , p. 33.

MARGINAL RECORDS.—British Columbia: *upper Fraser River drainage* (Anderson, 1947:179); Mt. Bickford (Cowan, 1939:90); vicinity Peavine Lake (*ibid.*); *North Thompson River drainage* (Anderson, 1947:179); Moyie Range, E of Kootenay Lake (*ibid.*). Idaho: neighborhood Elk City (Davis, 1939:371). Washington: Usk (Anderson, 1947: 179); Okanagan County (*ibid.*). British Columbia: Rainbow Mts. (Cowan and Guiguet, 1956:382).

Rangifer tarandus osborni J. A. Allen

1902. *Rangifer osborni* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:149, April 16, type from Cassiar Mts. [60 mi. SE Dease Lake], British Columbia.
1910. *Rangifer tarandus osborni*, Ward, Records of big game, ed. 6, p. 85.
1935. *Rangifer montanus selousi* Barclay, Proc. Zool. Soc. London, p. 306, July 4, type from mountains S of South Fork of Macmillan River, 5000 ft., Yukon.

MARGINAL RECORDS.—Yukon: Plateau Mtn., Macmillan River (Murie, 1935:82); Riddell River (*ibid.*); Macmillan Pass (Rand, 1945a:50); headwaters Pelly River (Anderson, 1947:179). British Columbia: head Sikanni Chief River (Sheldon, 1932:199); Laurier Pass (*ibid.*); Omineca Mts. (Cowan and Guiguet, 1956:383); Glenora Mtn. (Jacobi, 1931:92); Level Mtn. (J. A. Allen, 1903:526); Atlin (Cowan and Guiguet, 1956:383). Yukon: mountains above Rose River (Rand, 1945a:50).

Rangifer tarandus pearyi J. A. Allen

1902. *Rangifer pearyi* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:409, October 31, type from Ellesmere Land, 79° N, Franklin.
1915. *Rangifer tarandus pearyi*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4:256.

MARGINAL RECORDS.—Franklin: Cape Hecla, Ellesmere Island (Jacobi, 1931:112). Greenland: N of Kane Basin (Anderson, 1947:180). Franklin: Craig Harbour, Ellesmere Island (*ibid.*); Hyperit Point, Axel Heiberg Island (*ibid.*); *N Devon Island* (Jacobi, 1931:84, identified only as "Rentiere"); *Prince Patrick Island* (*ibid.*); *Meighen Island* (*ibid.*).

Rangifer tarandus sibiricus Murray

1866. *Rangifer tarandus sibiricus* Murray, Geographical distribution of mammals, p. 334 (description on p. 155). Type locality, Siberia, eastward of the River Lena (West Siberia, near Beresov, according to Hollister, Smithsonian Miscl. Coll., 56 (No. 35):7, February 7, 1912). *Cervus sibiricus* Schreber, 1784, is not a valid name; see Ellerman and Morrison-Scott, Checklist of Palaearctic and Indian mammals, 1758 to 1946, British Museum, p. 379, 1951.
1915. *Tarandus rangifer lenensis* Millais, *in* The gun at home and abroad . . . , p. 219. Type locality, Delta of River Lena, Siberia.
1915. *Tarandus rangifer chukchensis* Millais, *in* The gun at home and abroad . . . , p. 220. Type locality, Delta of River Lena, Siberia (a domesticated form).
1915. *Tarandus rangifer yakutskensis* Millais, *in* The gun at home and abroad . . . , p. 222. Type locality, Yakutsk, Siberia (a domesticated form).
1931. *Rangifer arcticus asiaticus* Jacobi, Zool. Anzieger, 96, suppl.: 85, type from Kolyma River, NE Siberia, a renaming of *R. t. sibiricus* Murray, 1866.
1936. *Rangifer tarandus transuralensis* Hilzheimer, Zeitschr. Säuget., 11:155, type from Konda River, western Siberia.

INTRODUCED in NW Alaska, and later on Richards Island, and E of Mackenzie Delta; spread to lower Anderson River (Anderson, 1947:187); see also Murie, 1935:7. Not mapped.

Rangifer tarandus stonei J. A. Allen

1901. *Rangifer stonei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 14:143, May 28, type from Kenai Peninsula, Alaska.
1901. *Rangifer tarandus stonei*, Lydekker, Great and small game of Europe . . . , p. 36.
1912. *Rangifer excelsifrons* Hollister, Smiths. Miscl. Coll., 56(35):5, February 7, type from Meade River, near Point Barrow, Alaska.
1915. *Tarandus rangifer ogilvyensis* Millais, *in* The gun at home and abroad . . . , p. 263, type from Ogilvie Mts., N of Dawson, Yukon.
1919. *Rangifer mcguirei* Figgins, Proc. Colorado Mus. Nat. Hist., 3(1):1, December 28, type from Kletson Creek, a tributary of the White River, 4 mi. E Alaska-Yukon boundary, Yukon.

MARGINAL RECORDS.—Mackenzie: Richards Island (Porsild, 1945:20); mountains W of Aklavik (*ibid.*). Yukon: Whitehorse area (Rand, 1945b:80). Alaska: coast range above Skagway (Murie, 1935:77); mts. E of Kussilluf Lake (J. A. Allen, 1904:277); near Andreasfski (Osgood, 1900b: 23); Unalakleet (*ibid.*), thence around coast to point of beginning.

Rangifer tarandus sylvestris (Richardson)

1829. *Cervus tarandus* var. *sylvestris* Richardson, Fauna Boreali-Americana, 1:250. Type locality, southwestern shores of Hudson Bay.

1915. *Rangifer tarandus sylvestris*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 4: 248.
1915. *Tarandus rangifer keewatinensis* Millais, *in* The gun at home and abroad . . . , p. 257. Type locality, central or northern Manitoba, or Keewatin, or north or south Saskatchewan or as far north as the Peace River or Lake Athabasca (see Miller and Kellogg, Bull. U.S. Nat. Mus., 205:815, March 3, 1955).

MARGINAL RECORDS.—Mackenzie: wooded country S of Eskimo Lakes (Porsild, 1945:21); E shore Artillery Lake (J. A. Allen, 1910:8). Manitoba: *northern Manitoba* (Anderson, 1947:181). Ontario: *northwestern Ontario* (*ibid.*). Manitoba: N part Whiteshell Forest Reserve (Soper, 1946: 151); E central part Sandilands Forest Reserve (*ibid.*). Minnesota: Cook County (Swanson, 1945:100); Beltrami County (*ibid.*). North Dakota: Turtle Mts. (V. Bailey, 1927: 33, as *R. c. caribou*, here assigned to *sylvestris* on geographic grounds). Manitoba: *E of Lake Winnipeg* (Hollister, 1912a: 4). Alberta: Lesser Slave Lake (Soper, 1948:63); N of Clear Hills (*ibid.*).

Rangifer tarandus tarandus (Linnaeus)

1758. [*Cervus*] *tarandus* Linnaeus, Syst. nat., ed. 10, 1:67. Type locality, high mountains of Swedish Lapland.
1843. *Rangifer tarandus*, Gray, List of the . . . Mammalia in the . . . British Museum, p. 181.
1827. *Tarandus lapponum* Billberg, Synopsis faunae Scandinaviae, 1:22, a renaming of *Cervus tarandus* Linnaeus.
1842. *Tarandus borealis* Rüppell, Mus. Senckenbergianum, 3:183, a renaming of *Cervus tarandus* Linnaeus.
1852. *Tarandus furcifer* Baird, Rept. Comm. Patents, 2 (Agric.):109, a renaming of *Cervus tarandus* Linnaeus.
1902. [*Rangifer tarandus*] var. *cylindricornis* Camerano, Mem. Reale Accad. Sci. Torino, ser. 2, 51:167, a renaming of *Cervus tarandus* Linnaeus.

INTRODUCED in central Yukon; Newfoundland; Fort Smith, Mackenzie; Lake Harbour, Baffin Island; Lobster Bay, Saguenay Co., Quebec; Anticosti Island, Quebec. Probably no longer extant in any of these localities (Anderson, 1947: 187). Not mapped.

Rangifer tarandus terraenovae Bangs

1896. *Rangifer terraenovae* Bangs, Preliminary description of the Newfoundland caribou, Boston, p. 1, November 11, type from Codroy, Newfoundland.
1896. *Rangifer tarandus terraenovae*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 8:233, November 21.
1896. *Rangifer terraenovae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 8:233, November 21, type from Grand Lake, Newfoundland. Not Bangs, 1896.

MARGINAL RECORDS.—Newfoundland: type locality; Humber River (J. A. Allen, 1900:6).

SUPERFAMILY BOVOIDEA

Chiefly grazers; horns, usually present on both sexes, permanent bony outgrowths from skull, covered with highly keratinized horny sheath that is permanent (Bovidae) or shed and replaced annually (Antilocapridae).

FAMILY ANTILOCAPRIDAE—Pronghorn

Horn-cores simple or forked; sheath sometimes forked when core is simple; sheath shed annually. Of the several genera, only one persists into Recent time.

Genus Antilocapra Ord—Pronghorn

1818. *Antilocapra* Ord, Jour. Phys. Chim. Hist. Nat. et Arts, 87:149, August. Type, *Antilope americana* Ord.
1827. *Dicranoceros* Hamilton-Smith, *in* Griffith, The animal kingdom . . . by the Baron Cuvier . . . , 4:169. Type, *Antilope americana* Ord.

For characters see account of *Antilocapra americana*.

Antilocapra americana
Pronghorn

External measurements of males: 1245–1472; 89–178; 400–432. Weight to approximately 138 lbs. Females average approximately 10 per cent smaller than males. Basilar length, 240–256; occipitonasal length, 216–240; alveolar length of maxillary toothrow, 67–72. Upper parts warm tan, neck with black mane; underparts, rump, and 2 bands across neck white. Horns in both sexes, deciduous, composed of fused hairs, branched about ⅔ distance between base and tip; bony horn-core unbranched, flattened laterally, sharp anteriorly, rounded posteriorly. Dew-hoofs absent. Frontal sinuses open to outside by two large, longitudinal fossae in dorsal surface of frontal bones; orbits large, situated ventral to horn-cores; lacrimal bone not articulating with nasal bone; cheek-teeth hypsodont, selenodont, and rootless; p4 with closed anterior fossette. Dentition, i. $\frac{0}{3}$, c. $\frac{0}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$.

Pronghorns are now reduced in numbers over much of their former range. They eat sagebrush, buckbrush, rabbitbrush and other browse as well as some grass. Breeding takes place in August and September, and the young (average 1.5) are born after a gestation period of 230–240 days. Triplets are rare.

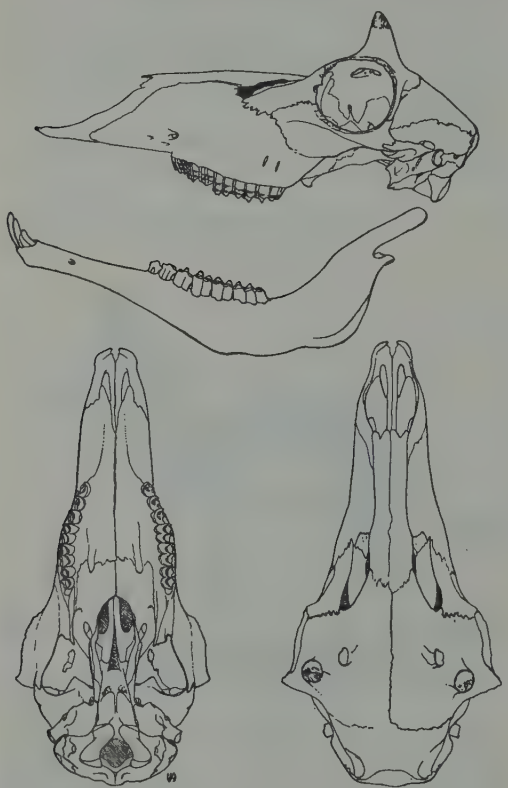


Fig. 533. *Antilocapra americana americana*, 13 mi. W and 6 mi. N Deep Hole, Washoe Co., Nevada, No. 93881 M.V.Z., ♀, X ¼.

Antilocapra americana americana (Ord)

1815. *Antilope americana* Ord, *in* Guthrie, A new geogr., hist. and comm. grammar . . . , Philadelphia, ed. 2, 2: 292 (described on p. 308). Type locality, plains and highlands of the Missouri River.

1818. *Antilocapra americana* Ord, Jour. Phys. Chim. Hist. Nat. et Arts, 87:149.

1855. *Antilocapra anteflexa* Gray, Proc. Zool. Soc. London, p. 10, March 27, type "most probably from America." (Based on an anomolous pair of horns.)

MARGINAL RECORDS.—Saskatchewan: Carlton House (Rand, 1947:1). Manitoba: *southwestern Manitoba* (Anderson, 1947:182). Minnesota (Swanson, 1945:102): Kittson County; Lyon County. Iowa: *western Iowa* (Scott, 1937: 91). Oklahoma: Kay County (Blair, 1939:130). New Mexico (V. Bailey, 1932:23–24): Portales; Eddy; about Jarilla; Beaver Dam Creek, E base Mogollon Mts. Arizona: SE of Springerville (Nelson, 1925:25); Flagstaff (V. Bailey, 1935: 3); Williams (*ibid.*); Antelope Valley (Nelson, 1925:24). California: W side Colorado Desert, near Mexican line (Grinnell, 1933:209); Campo (Nelson, 1925:27); San Jacinto Valley (Grinnell, 1933:209); Antelope Valley (*ibid.*); Salinas Valley (*ibid.*); Contra Costa County (*ibid.*); Shasta Valley (*ibid.*); vicinity Mt. Dome (Nelson, 1925:27). Nevada (Hall, 1946:633): 12-mile Creek, Washoe Co.; High Rock Canyon, 5000 ft. Idaho (Davis, 1939:374): forks of Owyhee River, Owyhee Co.; Antelope Valley; Lemhi Valley; Medicine Lodge Creek, Clark Co. Montana (Nelson, 1925: 36): Red Rock [Deer] Creek, Beaverhead Co. Alberta: near Rocky Mountain House (Rand, 1947:1).

Antilocapra americana mexicana Merriam

1901. *Antilocapra americana mexicana* Merriam, Proc. Biol. Soc. Washington, 14:31, April 5, type from Sierra en Media [about 10 mi S New Mexico border], Chihuahua.

MARGINAL RECORDS.—Arizona: near Peach Springs (Mearns, 1907:227); Big Chino Valley (*ibid.*); Mogollon Mtn., 25 mi. NE Fort Verde (*op. cit.*:222). New Mexico (V. Bailey, 1932:28): 15 mi. W Las Palomas; valley E of Socorro; Tularosa Valley; W of Organ Mts. Texas (Dawson, 1949: map, not assigned to subspecies): western Fannin County; central Kaufman County; western Robertson County; western Bastrop County; NE Kennedy County. Hidalgo: Cazadero (Villa, 1951:19). San Luis Potosí: Tanque de Dolores (Dalquest, 1953b:208). Zacatecas: llanos de Palula, between boundary of San Luis Potosí and 60 km. NNW Catorce (Villa, 1951:24). Chihuahua: llanos de Ocampo, 9 km. NNE Ocampo (Villa, 1951:23). Sonora: llanos de Guaje, 108 km. NW Ocampo (*ibid.*). Arizona: base of Huachuca Mts. (Hoffmeister and Goodpaster, 1954:137); Lechuguilla Desert (Mearns, 1907:231), thence northward, west of Colorado River, to point of beginning.

Antilocapra americana oregona V. Bailey

1932. *Antilocapra americana oregona* V. Bailey, Proc. Biol. Soc. Washington, 45:45, April 2, type from Hart Mountain (Warner Mts.), Lake Co., Oregon.

MARGINAL RECORDS.—Washington: *much of plains country of eastern Washington* (Taylor and Shaw, 1929:31). Oregon: warm springs near sources of John Dea's [Day] River, about 100 mi. from Fort Dalles (Suckley and Gibbs, 1860:136); near Antone (Nelson, 1925:46); southern Malheur County (*op. cit.*:47); Warner Lake Valley (V. Bailey, 1936:72); Rogue River Valley (*op. cit.*:71); Pumice Desert between Crater Lake and Diamond Lake (*op. cit.*:72); head N fork Umpqua River (*ibid.*); S of The Dalles (*op. cit.*:71).

Antilocapra americana peninsularis Nelson

1912. *Antilocapra americana peninsularis* Nelson, Proc. Biol. Soc. Washington, 25:107, June 29, type from 45 mi. S Calmallí, Baja California.

MARGINAL RECORDS.—Baja California: Cañon Esperanza (Elliot, 1903:208); San Felipe Bay (*ibid.*); inland from Santa Rosalía Bay (Townsend, 1912:119); S beyond Magdalena Bay (Nelson, 1925:64); type locality; Vizcaíno Bay (Nelson, 1925:64); San Quentín (Elliot, 1903:208).

Map 495. *Antilocapra americana.*

1. *A. a. americana* 2. *A. a. mexicana* 3. *A. a. oregona* 4. *A. a. peninsularis* 5. *A. a. sonoriensis*

Antilocapra americana sonoriensis Goldman

1945. *Antilocapra americana sonoriensis* Goldman, Proc. Biol. Soc. Washington, 58:3, March 21, type from 40 mi. N Costa Rica, a ranch on N side of Río de Sonora, SW of Hermosillo, Sonora.

MARGINAL RECORDS.—Arizona: near Cipriano Well, Organ Pipe Cactus National Mon. (Huey, 1942:363); Crittenden (Goldman, 1945:4). Sonora: Hermosillo (Burt, 1938:73); type locality; Santa Rosa Valley, near Monument No. 183 (Burt, 1938:73).

FAMILY **BOVIDAE**—Bovids

Frontal appendages hollow, non-deciduous, horny sheaths supported by bony cores, frequently present in both sexes. Upper canines absent; lower canines with simple crowns; cheek-teeth frequently hypsodont. Lateral toes always incomplete, sometimes absent; lower ends of lateral metacarpals absent. Gall bladder usually present; placenta with numerous cotyledons.

KEY TO NORTH AMERICAN GENERA OF BOVIDAE

1. Total length more than 2000; length of skull more than 350; length of maxillary tooth-row more than 120.
   2. Tail longer than 300; horns smooth, conical; accessory column on inner side of molars not reduced; paroccipital processes widely separated from condyles. *Bison*, p. 1024
   2′. Tail shorter than 150; horns rugose, flattened at base; accessory column on inner side of molars reduced; paroccipital processes not widely separated from condyles. . . . . *Ovibos*, p. 1028
1′. Total length less than 2000; length of skull less than 350; length of maxillary tooth-row less than 120.
   3. Tail longer than 150; lacrimal pits absent; horns less than 6 ins. in circumference at base. . . . . *Oreamnos*, p. 1026
   3′. Tail shorter than 150; lacrimal pits present; horns more than 6 ins. in circumference at base. . . . . *Ovis*, p. 1030

Genus **Bison** Hamilton-Smith—Bison

1827. *Bison* Hamilton-Smith, *in* Griffith, The animal kingdom . . . by the Baron Cuvier . . . , 5:373. Type, *Bos bison* Linnaeus.

Forehead short, broad; muzzle narrowed; nasals pointed, not reaching premaxillae; nasal opening composed of premaxillae, maxillae, and nasals; orbits tubular, composed of frontals, lacrimals, and jugals; molars with style between anterior and posterior lobes; both sexes having permanent horns. Dentition, i. $\frac{0}{3}$, c. $\frac{0}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$

Bison bison
Bison

External measurements: (♂) 3042–3803; 330–913; 584–661; (♀) 2132–2896; 304–508; 508. Weight of large male approximately 818 kg.; large female, 545 kg. Head heavy; neck short; shoulders high, humped; tail short, tufted at tip; fur on head, neck, and shoulders brownish black, long, wooly, forming beard on chin; fur of body short, brown to light brown. Greatest length of skull, (♂) 491–595; basilar length, (♂) 454–555; alveolar length of molars, (♂) 82–98; length of maxillary tooth-row, (♂) 142–150, (♀) 135–147.5.

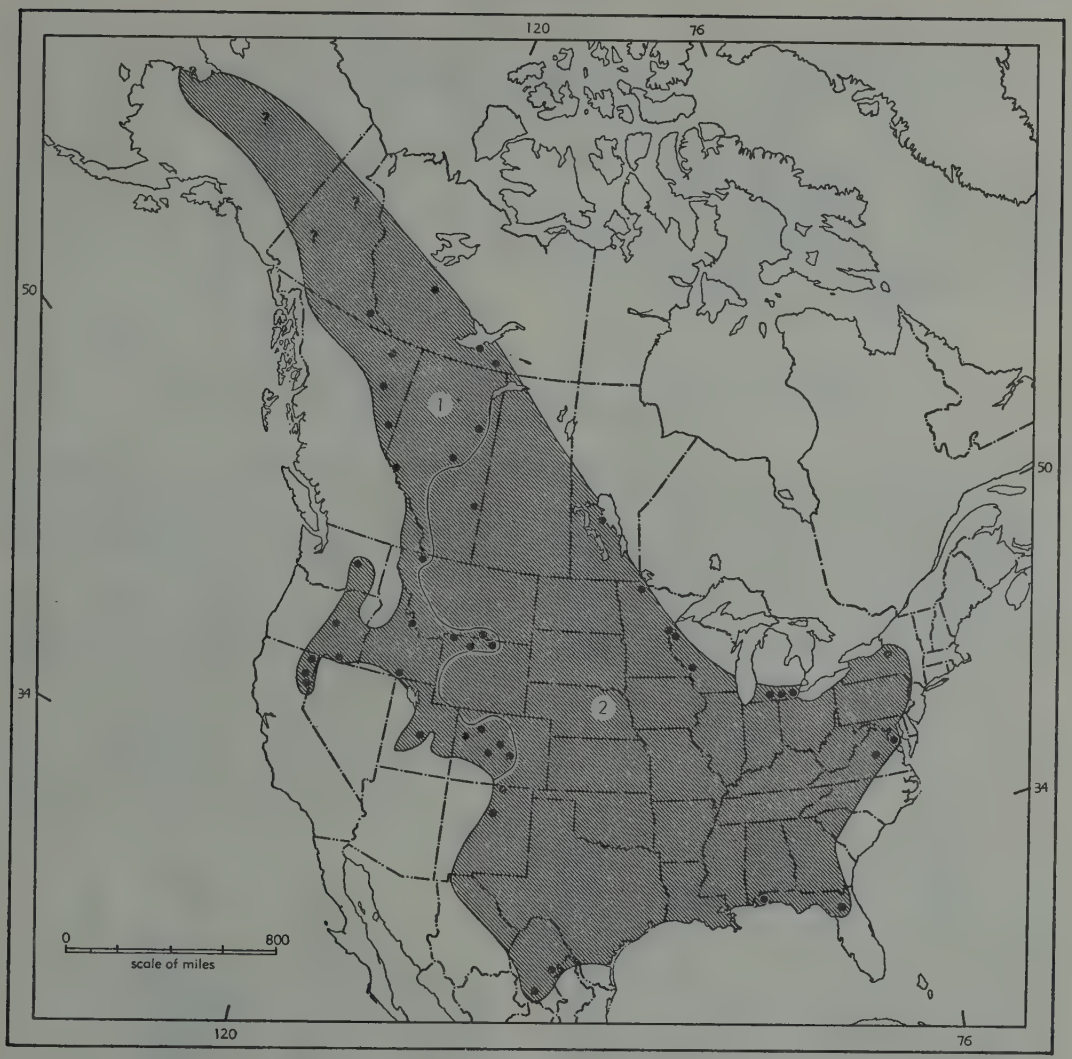
Bison once roamed central North America almost from the Atlantic Coast to the Pacific Coast in numbers estimated at 60,000,000. By 1889 wanton killing of the herds had reduced the bison to fewer than 1000. Since then the bison has existed only as a ward of man.

Bison feed almost entirely on grasses, though when food is scarce they browse on some plants such as sagebrush. They breed from July to October, and the young are born after a gestation period of approximately 9 months. Cows breed at 3 years, and some continue to bear young until at least 28 years old. One young is the rule, although twins are not rare.

Bison bison athabascae Rhoads

1898. *Bison bison athabascae* Rhoads, Proc. Acad. Nat. Sci. Philadelphia, 49:498, January 18, type from within 50 mi. SW Fort Resolution, Mackenzie.
1899. *Bison occidentalis* Lucas, Proc. U.S. Nat. Mus., 21: 758, type from St. Michael, Alaska.
1932. *Bison bison oregonus* V. Bailey, Proc. Biol. Soc. Washington, 45:48, April 2, type from Malheur Lake, Harney Co., Oregon.
1933. *Bison bison haningtoni* Figgins, Proc. Colorado Mus. Nat. Hist., 12(4):30, December 5, type from head of Rock Creek, NE of South Park, Park Co., Colorado.

MARGINAL RECORDS.—Alaska?: 30 mi. above mouth Tanana River (Skinner and Kaisen, 1947:167). Yukon?: Peel River (*ibid.*). Mackenzie: vicinity Great Marten Lake (Soper, 1941:358); type locality; 40 mi. NE Fort Smith (J. A. Allen, 1900:65). Alberta: E side Athabaska above and below Fort McMurray (Soper, 1941:357); between Methye Portage and Lake La Biche (*ibid.*). Montana: Glacier National Park (V. Bailey, 1918:26). Idaho: Agency Creek, Lemhi Co. (Davis, 1939:377). Wyoming: Gardner River, Yellowstone National Park (Skinner and Kaisen, 1947: 167). Montana: Pryor Mts. (Fryxfell, 1928:138). Wyoming: W slope Big Horn Mts., 9000 ft. (*ibid.*); 22 mi. W Cody, 6000 ft. (21906 KU). Colorado: Lost Park, near Marvin Lake (Bergtold, 1929:170); Alma, 10,232 ft. (Skinner and Kaisen, 1947:167); Pike's Peak region (Warren, 1942: 297); Elk Mts., Gunnison Co. (*ibid.*); top of Book Cliffs (Bergtold, 1929:170). Utah: Twelve Mile Creek Canyon, near Gunnison (Skinner and Kaisen, 1927:167). Idaho: 20 mi. W Raft River, Cassia Co. (Davis, 1939:377). Oregon: Barren Valley, E of Steens Mts. (V. Bailey, 1936:58). California (V. Bailey, 1936:59): near Honey Lake; near Eagle Lake; Alturas Valley. Oregon: Izee (Skinner and Kaisen,



Map 496. *Bison bison.*

1. *B. b. bison* 2. *B. b. athabascae*

1947:168). Washington: Grand Coulee (Dalquest, 1948: 404). British Columbia: *northeastern British Columbia* (Anderson, 1947:182). Alberta: 15 mi. S Henry House, Buffalo Prairie (Hollister, 1912c:39). British Columbia: Fort St. John region (Anderson, 1947:182); Cypress Creek (Sheldon, 1932:198); Fort Nelson (J. A. Allen, 1900:64). Yukon: near Fort Liard (Soper, 1941:359); 12 mi. above mouth Pelly River, near Selkirk? (Skinner and Kaisen, 1947:167). Alaska?: near St. Michael (*ibid.*).

Bison bison bison (Linnaeus)

1758. [*Bos*] *bison* Linnaeus, Syst. nat., ed. 10, 1:72. Type locality, ancient "Quivira," central Kansas (Hershkovitz, Proc. Biol. Soc. Washington, 70:32, June 28, 1957).

1888. *B*[*ison*]. *bison*, Jordan, Manual of the vertebrate animals . . . , ed. 5, p. 337.

1762. *Bison americanus* Brisson, Regnum animale . . . , p. 56. Type locality, America.

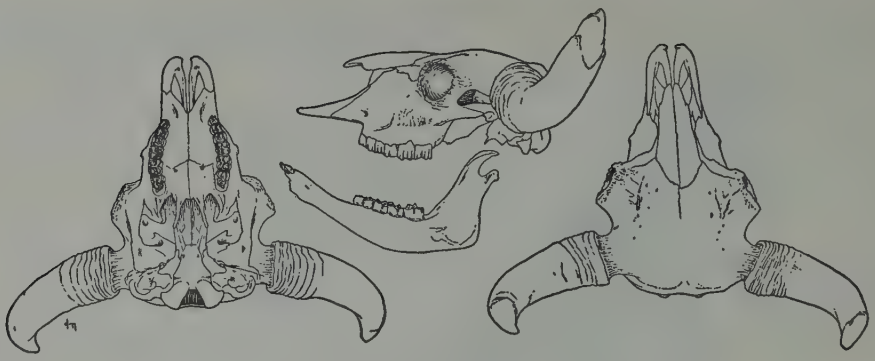


Fig. 534. *Bison bison bison*, Buffalo National Park, Wainwright, Alberta, No. 48115 K.U., ♂, X 1/12.

1915. *Bison sylvestris* Hay, Proc. U.S. Nat. Mus., 48:515, April 8, type from Huron County, Ohio (Pleistocene).
1915. *Bison americanus pennsylvanicus* Shoemaker, A Pennsylvania bison hunt, p. 9. Type locality, Pennsylvania (based on hearsay and regarded as invalid by Skinner and Kaisen, Bull. Amer. Mus. Nat. Hist., 89:163, October 31, 1947; see Opinion 2, International Commission on Zoological Nomenclature).
1933. *Bison bison septemtrionalis* [*sic*] Figgins, Proc. Colorado Mus. Nat. Hist., 12:28, December 5, type from 6 mi. NE Palmer, Merrick Co., Nebraska.

MARGINAL RECORDS.—Saskatchewan: *northern edge Great Plains region* (Anderson, 1947:182). Manitoba: Lake Winnipeg (Garretson, 1938:7). Minnesota: Lake of the Woods (Surber, 1932:79); SE Pine County (*ibid.*). Wisconsin (Cory, 1912:94): St. Croix River; Tremepleau [= Trempealeau] River. Michigan (Burt, 1946:265, map): Kalamazoo County; Jackson County; Wayne County. New York: salt lakes, vicinity of Syracuse (Miller, 1899:298). District of Columbia: [Washington] (Seton, 1929:645). Virginia: Goochland County (Handley and Patton, 1947:194). Florida: Newman's Lake (Sherman, 1954:228); vicinity Pensacola (Swanton, 1938:380), thence westward to Coahuila (Baker, 1956:326): Monclova; Parras. Chihuahua: *NW Chihuahua* (Brand, 1937:51). New Mexico (V. Bailey, 1932:12, 15): near Ribera; upper valley of the Vermejo. Colorado: *plains east of the mountains* (Cary, 1911:61). Wyoming: *eastern Wyoming* (Skinner and Kaisen, 1947:158, map). Montana: *east of continental divide* (Miller and Kellogg, 1955:818). Alberta: Wainwright (48115 KU); *Hand Hills, 500 mi. W Manitoba* (Seton, 1929:670).—See Reed (1955:130) on early occurrence in *Arizona* and New Mexico.

Genus Oreamnos Rafinesque—Mountain Goat

1817. *Oreamnos* Rafinesque, Amer. Monthly Mag., 2:44, November. Type, *Mazama dorsata* Rafinesque [= *Rupicapra americana* Blainville].
1827. *Aplocerus* Hamilton-Smith, *in* Griffith, The animal kingdom . . . by the Baron Cuvier . . . , 5:354. Type, *Antilope lanigera* Hamilton-Smith [= *Rupicapra americana* Blainville].
1844. *Haplocerus* Wagner, *in* Schreber, Die Säugthiere . . . , Suppl., 4:462, a renaming of *Aplocerus* Hamilton-Smith.
1884. *Haploceros* Flower and Garson, Cat. Osteol. Mus. R. Coll. Surg., pt. 2, p. 257, an accidental renaming of *Haplocerus* Wagner.
1901. *Oreamnus* Elliot, A synopsis of the mammals of North America . . . (Zool. Publ. Field Mus.), 2:44, an accidental renaming of *Oreamnos* Rafinesque.

Body stocky, hump on withers, muzzle small, "beard" present, tail short; interdigital cleft deep, foot-glands rudimentary or absent, cannon bones broad; facial glands and lacrimal depression absent; horns present in both sexes, moderate in size, unbranched, conical, ridged at base, diverging laterally, inclining posteriorly; a pair of bare black glands present behind horns; hair white or yellowish white, long, with thick, wooly underfur, mammae 4. Dentition, i. $\frac{0}{3}$, c. $\frac{0}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$.

Oreamnos americanus
Mountain Goat

External measurements: (♂) 1521–1787; 152–203; 330–368. Weight, 150–300 lbs. Females are

10 to 20 per cent smaller than males in some dimensions. Basal length of skull, 270–293; occipitonasal length, 299–336; interorbital breadth, 95–98; palatilar length, 176–184; length of maxillary tooth-row, 69–77. Other characters as for the genus.

Mountain goats live in high, rocky areas above timberline; they are excellent climbers and frequent places inaccessible to any other animal of the same size. They graze on grasses and sedges and browse on shrubs. The breeding season is in November and the 1 or 2 young are born from April to June.

Oreamnos americanus americanus (Blainville)

1816. *R[upicapra]. americana* Blainville, Bull. Soc. Philom., Paris, p. 80. Type locality, restricted to Cascade Range, near the Columbia River, in Oregon or Washington by Hollister, Proc. Biol. Soc. Washington, 25:185, December 24, 1912; regarded as probably Mount Adams, Washington, by Dalquest, Univ. Kansas Publ., Mus. Nat. Hist., 2: 409, April 9, 1948.
1912. *Oreamnos americanus americanus*, Hollister, Proc. Biol. Soc. Washington, 25:186, December 24.
1815. *Ovis montanus* Ord, *in* Guthrie, A new geogr., hist. and comm. grammar . . . , Philadelphia, ed. 2, 2:292. Not Schreber, 1804, or Tiedemann, 1808.
1817. *Mazama dorsata* Rafinesque, Amer. Monthly Mag., 2: 44, November, a renaming of *Ovis montanus* Ord.
1817. *Mazama sericea* Rafinesque, Amer. Monthly Mag., 2: 44, November, a renaming of *Rupicapra americana* Blainville.
1822. *Antilope lanigera* Hamilton-Smith, Trans. Linn. Soc., 13:38, a renaming of *Rupicapra americana* Blainville.
1823. *Capra columbiana* Desmoulins, Dict. Class Hist. Nat., 3:580, a renaming of *Rupicapra americana* Blainville.

MARGINAL RECORDS.—British Columbia (Cowan and Guiguet, 1956:391): Kynoch Inlet; Tesla Lake; Texas Creek; Manning Park. Washington (Dalquest, 1948:409): Lake Chelan; E of Mt. Stuart, Wenatchee Range; Mt. Adams. Oregon: Mt. Jefferson (Grant, 1905:236). Washington (Dalquest, 1948:409): Mt. St. Helens; Mt. Index; Mt. Higgins; Mt. Baker, thence northward to point of beginning.

Oreamnos americanus columbiae Hollister

1904. *Oreamnos montanus columbianus* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:20, February 10, type from Shesley Mts., British Columbia. Not *Capra columbiana* Desmoulins, 1823.
1912. *Oreamnos americanus columbiae* Hollister, Proc. Biol. Soc. Washington, 25:186, December 24, a renaming of *Oreamnos montanus columbianus* J. A. Allen.

MARGINAL RECORDS.—Yukon: La Pierre House (Rand, 1945b:87). Mackenzie (Anderson, 1947:186): Glacier Lake, Iron Mts., 4500 ft.; Nahanni Mts. British Columbia: N of Keily Creek (Sheldon, 1932:198); banks of Peace River (*ibid.*); Omineca Mts. (Stanwell-Fletcher and Stanwell-Fletcher, 1943:95). Alaska: Boca de Quadra; Taku River.

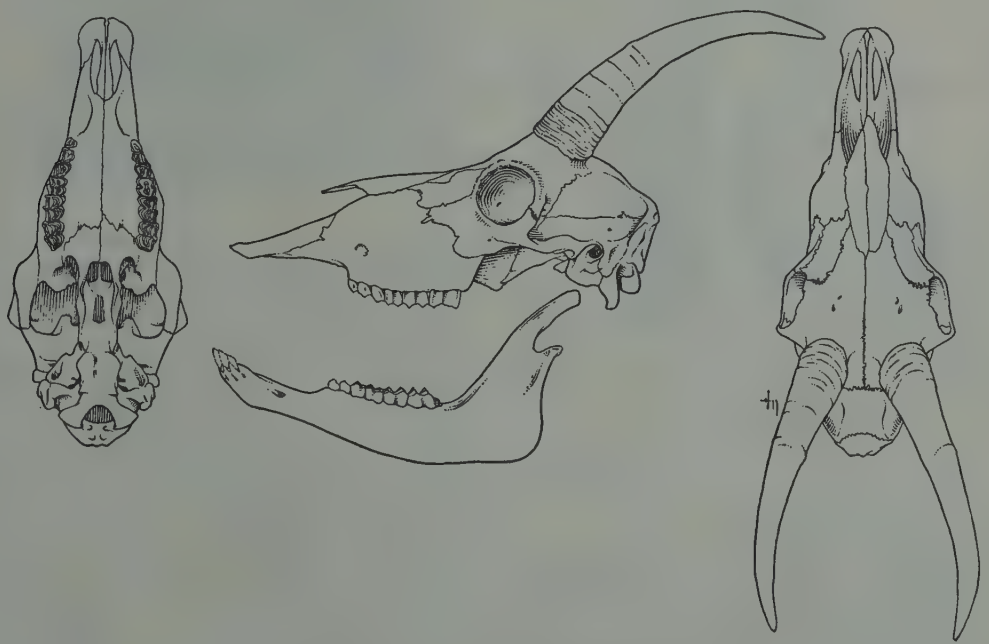


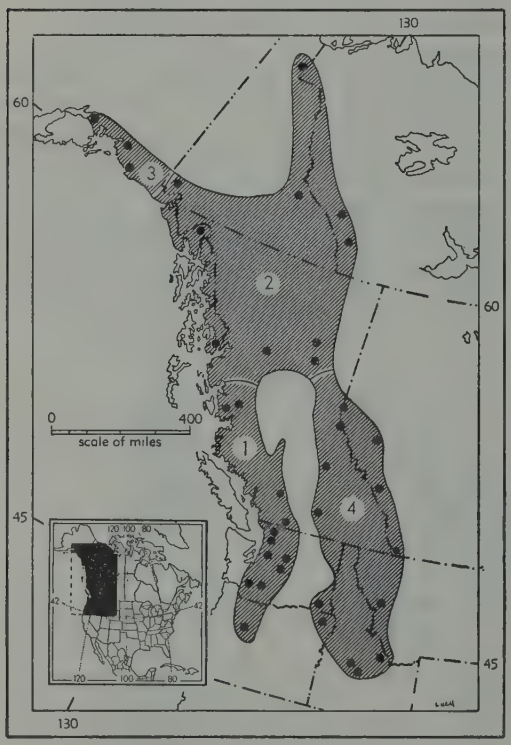
Fig. 535. *Oreamnos americanus americanus*, Tcho Park Mts., Washington, No. 1885 K.U., ♀, X ¼.

Yukon: St. Elias Range (Rand, 1945b:86); head of Pelly River (Anderson, 1947:186).

Oreamnos americanus kennedyi Elliot

1900. *Oreamnus* [*sic*] *kennedyi* Elliot, Field Columb. Mus., Publ. 46, Zool. Ser., 3:3, June 20, type from mountains at mouth Copper River, opposite Kayak Island, Alaska.
1913. *Oreamnos americanus kennedyi*, Lydekker, Catalogue of the ungulate mammals in the . . . British Museum, 1:221.

MARGINAL RECORDS.—Alaska: Cook Inlet (Swarth, 1922:193); Chugach Mts., near Thompson Pass (Strecker, *et al.*, 1952:480); type locality.



Map 497. *Oreamnos americanus.*

1. *O. a. americanus*
2. *O. a. columbiae*
3. *O. a. kennedyi*
4. *O. a. missoulae*

Oreamnos americanus missoulae J. A. Allen

1904. *Oreamnos montanus missoulae* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 20:20, February 10, type from Missoula, Missoula Co., Montana.
1912. *Oreamnos americanus missoulae*, Hollister, Proc. Biol. Soc. Washington, 25:186, December 24.

MARGINAL RECORDS—British Columbia: *nearly to Peace River* (Anderson, 1947:186). Alberta: mountains bordering Torrens River (Soper, 1947:162); Thoral Creek (Carter, *in* Crowe, 1943:409, as *columbiae*); Banff, Spray Creek (Anderson, 1947:186); Waterton Park (Soper, 1947:162). Montana: type locality. Idaho (Davis, 1939:379): Salmon River Mts., Lemhi Co.; Sawtooth Mts., near Alturus Lake; near Stanley Lake. Oregon: Wallowa County (Grant, 1905:237). Washington: Blue Mts. (Taylor and Shaw, 1929:31); *northeastern Washington* (Dalquest, 1948:409). British Columbia (Cowan and Guiguet, 1956:391, as *O. a. americanus*): Shorts Creek; Wells Gray Park. Alberta: Mt. Robson (Anderson, 1947:186).

Genus Ovibos Blainville—Muskox

Revised by J. A. Allen, Mem. Amer. Mus. Nat. Hist., n. s., 1:101–226, 8 pls., 46 figs., March, 1913.

1816. *Ovibos* Blainville, Bull. Soc. Philom., Paris, p. 76, May. Type, *Bos moschatus* Zimmermann.
1911. *Bosovis* Kowarzik, Zool. Anzeiger, 37:107, February 14. Type, *Bos moschatus* Zimmermann.

For characters see account of *Ovibos moschatus*. This genus is monotypic.

Ovibos moschatus
Muskox

External measurements: (♂) 2028–2434; 89–102; 432–508. Weight to 900 lbs. Females are smaller. Greatest length of skull, (♂) 422–516, (♀) 385–430; mastoid breadth, (♂) 149–198, (♀) 144–165; length of maxillary tooth-row, (♂) 130–150, (♀) 122–146. Horns of old males having broad base covering postorbital region of skull, decurved abruptly, recurved apically; roughened basally, smooth proximally; horns of females shorter, more slender, not so broad at base as in males. Legs and tail short; ears pointed, nearly concealed in hair. Upper parts dark brown, light patch in mid-dorsal region; chin, breast, belly black; forelegs and hind legs dirty white; upper side of tail black, underside white. Underfur thick, wooly, overhair coarse, long, nearly reaching the ground; space between nostrils and upper lip covered with short, close hair; mammae 4. Orbits tubular; nasals short, not reaching premaxillae; dentition resembling that of *Bison* but differing in being less hypsodont and in

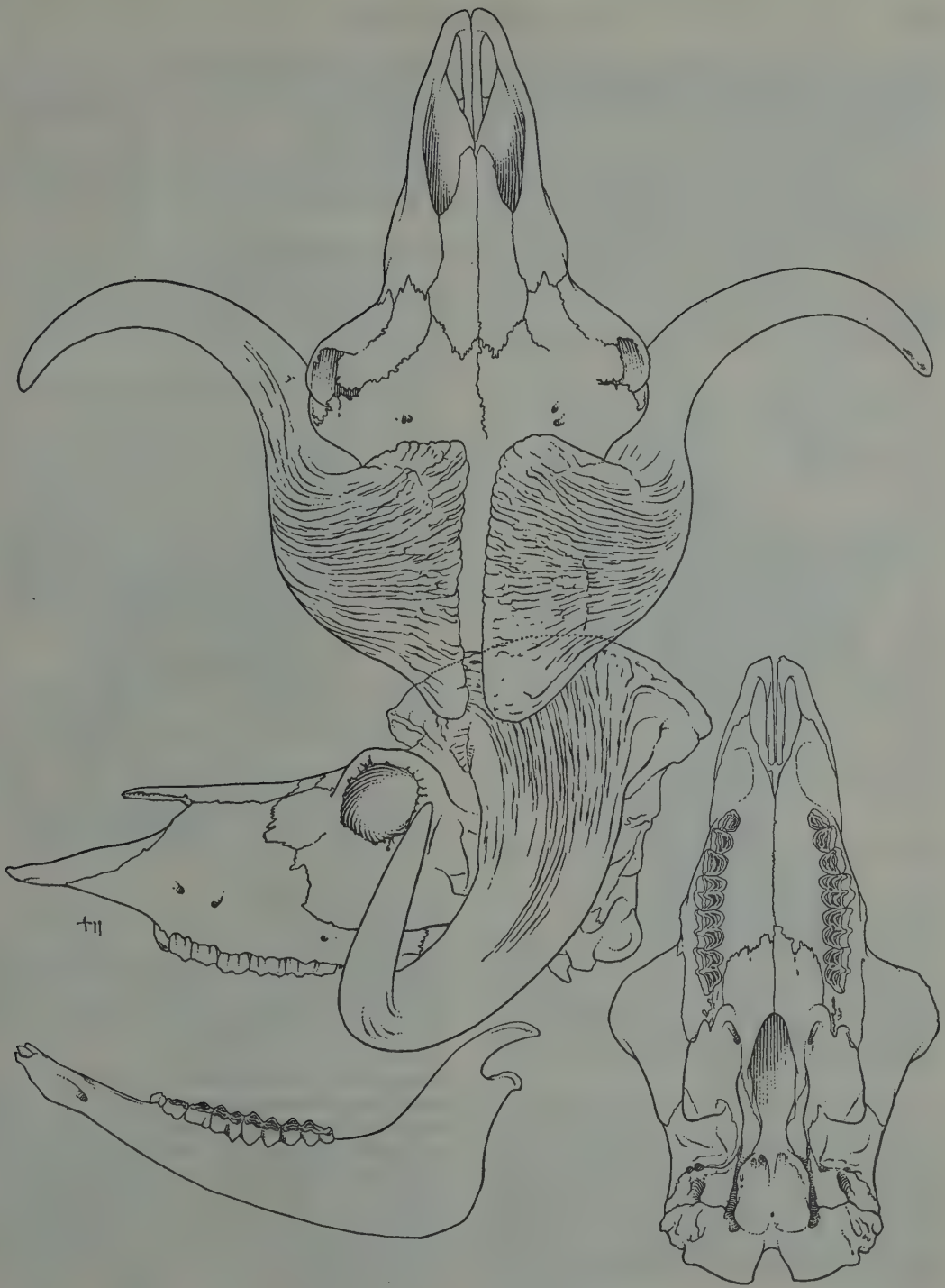
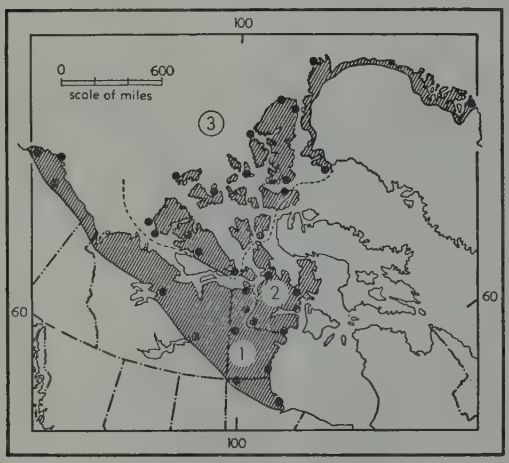


Fig. 536. *Ovibos moschatus* subsp. ?, near head Wagner Inlet, Hudson Bay, Canada, No. 19490 A.M., ♂, X ¼.

reduction of accessory column on inner side of molars; paroccipital processes not so widely separated from condyles as in *Bison*. Dentition, i. $\frac{0}{3}$, c. $\frac{0}{1}$, p. $\frac{3}{3}$, m. $\frac{3}{3}$.

Like so many other large ungulates, the muskox has been exterminated over much of its range. Small herds frequent the tundra and when attacked the animals form a defensive circle, with calves on the inside. Their food is almost entirely grasses and willows; in winter the muskox scrapes away snow with its hoofs to obtain food. The breeding season is in August and September, and the single offspring (twins are rare) is born in April or May.



Map 498. *Ovibos moschatus.*

1. *O. m. moschatus* 2. *O. m. niphoecus* 3. *O. m. wardi*

Ovibos moschatus moschatus (Zimmermann)

1780. *Bos moschatus* Zimmermann, Geographische Geschichte . . . , 2:86. Type locality, between Seal and Churchill rivers, Manitoba.

1822. *Ovibos moschatus*, Desmarest, *in* Encyclopédie méthodique . . . , Mammalogie . . . , pt. 2, p. 492.

1908. *O[vibos]. moschatus mackenzianus* Kowarzik, Zool. Anzeiger, 33:617, November 10, type from Great Slave Lake, Mackenzie.

MARGINAL RECORDS.—Alaska: Point Barrow (G. M. Allen, 1942a:330), thence eastward along Arctic Coast to Keewatin: near Sherman Inlet (Clarke, 1944:101); Back River (Hone, 1934:12); vicinity of Baker Lake (*ibid.*); NW of Cape Eskimo (Preble, 1902:44). Manitoba: halfway between York Factory and Fort Churchill (Seton, 1929:610); between Seal and Kazan rivers (*ibid.*). Mackenzie: Artillery Lake (G. M. Allen, 1942a:331); 40–50 mi. E Dease Bay, Great Bear Lake (Hone, 1934:9). Alaska: near Tulugak Creek (Rausch, 1951:193); Kunk [Kuk] River (J. A. Allen, 1913:188).

Ovibos moschatus niphoecus Elliot

1905. *Ovibos moschatus niphoecus* Elliot, Proc. Biol. Soc. Washington, 18:135, April 18, type from head of Wager River, Keewatin.

MARGINAL RECORDS.—Keewatin (Hone, 1934:12–13): Murchison River region; Repulse Bay; Wager Inlet; Chesterfield Inlet; N side Baker Lake.

Ovibos moschatus wardi Lydekker

1900. *Ovibos moschatus wardi* Lydekker, Nature, 63:157, December 13, type from Clavering Island, Greenland.

1909. *O[vibos] moschatus melvillensis* Kowarzik, Zool. Anzeiger, 33:617, November 10, type from Melville Island, Franklin.

1780. *Bos grunniens* Fabricius, Fauna Groenlandica, p. 28. Type locality, ice floe off W coast of Greenland. Not Linnaeus, 1766.

MARGINAL RECORDS (Hone, 1934:15–18, 20, 23).—Greenland: Cape Morris Jesup, southward along east coast to Cape Dalton; southward along west coast to Thule region. Ellesmere Island: Cape Columbia; Fort Conger; Feilden Peninsula. Devon Island: Cape Sparbo. Somerset Island: Cape Garry. Taylor Island. Victoria Island: N end Prince Albert Sound; NE Minto Inlet. Banks Island: Nelson Head; near Cape Kellett. Prince Patrick Island. Melville Island: Cape Mudge. Cornwall Island. Axel Heiberg Island: within 50 mi. of N end. Introduced on Nunivak Island, Alaska.

Genus **Ovis** Linnaeus—Sheep

American species revised by Cowan, Amer. Midl. Nat., 24:505–580, November, 1940.

1758. *Ovis* Linnaeus, Syst. nat., ed. 10, 1:70. Type, *Ovis aries* Linnaeus.

1762. *Aries* Brisson, Regnum animale . . . , p. 12. Type, *Aries* Brisson [= *Ovis aries* Linnaeus].

1766. *Musimon* Pallas, Spicilegia zoologica, 11:8. Type, *Musimon asiaticus* Pallas [= *Capra ammon* Linnaeus].

1798. *Musmon* Schrank, Fauna Boica, 1:78, a renaming of *Ovis* Linnaeus.

1816. *Ammon* Blainville, Bull. Soc. Philom., Paris, p. 76, a renaming of *Ovis* Linnaeus.

1847. *Caprovis* Hodgson, Jour. Asiatic Soc. Bengal, 16:702. Type, *Ovis musimon* Pallas.

1852. *Argali* Gray, Catalogue of the . . . Mammalia in the British Museum, 3:174. Type, *Aegoceros argali* Pallas [= *Ovis ammon* Linnaeus].

1936. *Pachyceros* Gromova, Neue Forsch. in Tierz. u. Abstamm. (Festschr. z. 60 Geburstag Dr. Duerst, Bern), p. 84. Type, *Ovis nivicola* Eschscholtz.

Body stout; nose narrow, pointed; ears small, pointed; tail, including hair, shorter than ear; lateral hoofs present; no beard on chin, horns of males either spiralled with tips directed outwards or bent in an arc with tips pointing either forward or toward each other behind the head; pedal glands and preorbital glands present, subcaudal glands absent. Coronal suture projecting forward in an angle; infraorbital foramen small, with well defined rim, about equal to length of P4; upper ends of pre-

maxillae not usually wedged between nasals and maxillae; lambdoidal suture forming more or less straight line.

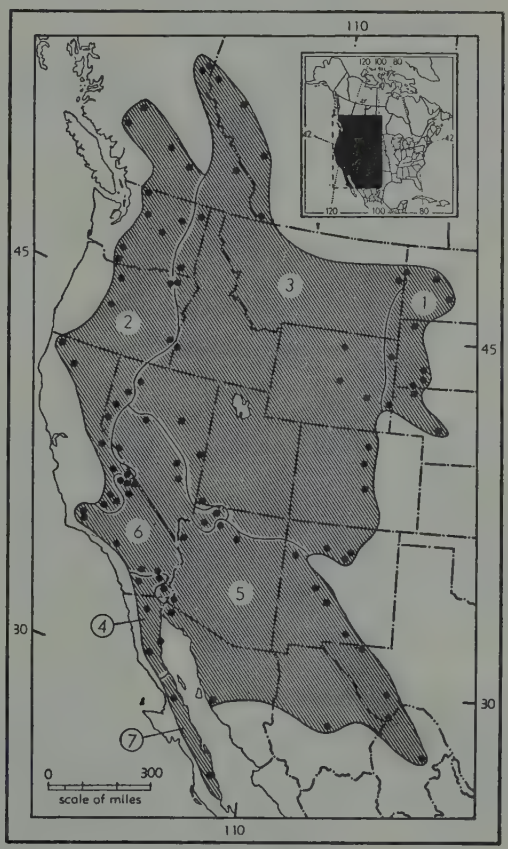
KEY TO NORTH AMERICAN SPECIES OF OVIS

1. Upper parts some shade of brown; length of nasals in males usually more than 105, in females usually more than 85. *O. canadensis*, p. 1031
1'. Upper parts whitish (except in *O. d. stonei*, which is brownish-black); length of nasals in males usually less than 105, in females usually less than 85. . . . . *O. dalli*, p. 1034

Ovis canadensis
Mountain Sheep

External measurements: (♂) 1326–1953, 70–150, 357–482; (♀) 1166–1887, 77–130, 276–420. Weights to 156 kg. Basilar length of skull, (♂) 247–285, (♀) 226–261; zygomatic breadth, (♂) 117–135, (♀) 107–123; mastoid breadth, (♂) 84–96, (♀) 71–87; length of upper molar series, (♂) 80–95, (♀) 77–96. Upper parts Natal Brown or Mars Brown to Vinaceous Buff or Pale Vinaceous Fawn, underparts light brown to white, rump yellowish white to white. Horns of adult males massive, broad at base (to 18½ ins. in circumference), not widespread (to 26 ins. from tip to tip). From *O. dalli*, *O. canadensis* differs in average larger external and cranial measurements, more massive, less rugose, and less widely expanded horns, and in having some shade of brown, rather than white or blackish.

Mountain sheep formerly inhabited the foothills of the western mountains, but with the advent of white man, they moved into the mountains and are now found only in mountainous areas. The food is mostly grass in the northern parts of the range, but in the south parts is primarily browse. In Colorado the breeding season is in November and December and the single lamb is born after a gestation period of 180 days, in May or June. In Texas, lambs are born in March or April.



Map 499. *Ovis canadensis*.

Guide to subspecies
1. *O. c. auduboni*
2. *O. c. californiana*
3. *O. c. canadensis*
4. *O. c. cremnobates*
5. *O. c. mexicana*
6. *O. c. nelsoni*
7. *O. c. weemsi*

Ovis canadensis auduboni Merriam

1901. *Ovis canadensis auduboni* Merriam, Proc. Biol. Soc. Washington, 14:31, April 5, type from Upper Missouri, probably Badlands between Cheyenne and White rivers, South Dakota.

MARGINAL RECORDS.—North Dakota: junction Yellowstone and Missouri rivers (Cowan, 1940:543); Missouri River between Little Knife and White Earth rivers (V. Bailey, 1927:25); Mandan (Cowan, 1940:543). South Dakota: Cave Hills, Harding Co. (Over and Churchill, 1945: 54); Imlay (Cowan, 1940:543); between Yellow Medicine and Porcupine creeks (Over and Churchill, 1945:54); Slim Buttes (*ibid.*). Nebraska: near Hay Springs (Jones, 1951: 1); Birdwood Creek (Jones, 1951:1). Wyoming: Spoon Butte (Cook, 1931:171); Black Hills (Cowan, 1940:543). Montana: *eastern Montana* (J. A. Allen, 1912:26).

Ovis canadensis californiana Douglas

1829. *Ovis californianus* Douglas, Zool. Jour., 4:332, January. Type locality, near Mount Adams, Yakima Co., Washington (see J. A. Allen, Bull. Amer. Mus. Nat. Hist., 31: 25, March 4, 1912) or Falls of the Columbia, near mouth of Deschutes River (see V. Bailey, N. Amer. Fauna, 55: 64–65, August 29, 1936).
1912. *Ovis canadensis californiana*, Miller, Bull. U.S. Nat. Mus., 79:396, December 31.
1912. *Ovis cervina sierrae* Grinnell, Univ. California Publ. Zool., 10:144, May 9, type from east slope Mount Baxter, 11,000 ft., Sierra Nevada, Inyo Co., California.
1915. *Ovis canadensis samilkameenensis* Millais, *in* The gun at home and abroad . . . , p. 324, type from Similkameen Mountains, British Columbia.
1913. *Ovis dalli ellioti* Kowarzik, Zool. Anzeiger, 41:444, a *nomen nudum*.

MARGINAL RECORDS (Cowan, 1940:557–559, unless otherwise noted).—British Columbia: 120 mi. NW Lillooet; Tranquille Creek; N end Okanagan Lake. Washington: Hellgate district, SE Ferry Co.; Grant County. Oregon: Blue Mts.; Mahogany Mts. Nevada: Division Peak; E side Pyramid Lake (Hall, 1946:640); along Truckee River (*ibid.*). California: Sonora Peak (Jones, 1950:33); Tin Mtn.; vicinity Olancha Peak; Glenville; Kaweah Peaks; Big Pine; Scott Mtn.; Siskiyou Mts. Oregon: vicinity of Bend (V. Bailey, 1936:66); Maupin. Washington: Klickitat Valley (Taylor and Shaw, 1929:31); type locality; Stehekin; Bauerman Ridge. British Columbia: Chilko Lake.

Ovis canadensis canadensis Shaw

1804. *Ovis canadensis* Shaw, Naturalists' Miscl., 51: text to pl. 610 (December, 1803?). Type locality, mountains on Bow River, near Exshaw, Alberta.
1900. *Nemorhoedus palmeri* Cragin, Bull. Geol. Soc. America, 11:611, August 10, type from Cave on Glen Eyrie estate, about 5 mi. NW Colorado Springs, El Paso Co., Colorado.

MARGINAL RECORDS (Cowan, 1940:537–541, unless otherwise noted).—British Columbia: Mt. Quintette, Kiskatenaw River. Alberta: Smoky River; Thoral Creek (Carter, *in* Crowe, 1943:409); Red Deer River; Waterton Lakes Park. Montana: Three Buttes. Wyoming: Bighorn Mts. (Honess and Frost, 1942:27); Rattlesnake Mts.; Laramie Mts. Colorado: Kenosha Range; Denver Mtn. Park; Pikes Peak (Warren, 1942:304). New Mexico: Truchas Peaks; Santa Fe Baldy; Frijoles Canyon, Jemez Mts. (V. Bailey, 1932:17). Utah: Virgin River Canyon, Utah-Arizona boundary. Nevada (Hall, 1946:640): Granite Mtn., 11,200 ft.; near head Willow Creek Canyon; King Lea Peak, Jackson Mts. Idaho: near Silver City. Oregon: upper Sheep Creek, Wallowa Mts., SE Joseph. Washington: upper Tucannon River; Pend Oreille Mts. (Dalquest, 1948:406). British Columbia: head Kootenay River, 35 mi. SW Banff; vicinity Wapiti Pass (Anderson, 1947:184).

Ovis canadensis cremnobates Elliot

1904. *Ovis cervina cremnobates* Elliot, Field Columb. Mus., Publ. 87, Zool. Ser., 3(14):239, January 7, type from Mattomi, Sierra San Pedro Mártir, Baja California.
1912. *Ovis canadensis cremnobates*, Miller, Bull. U.S. Nat. Mus., 79:396, December 31.

MARGINAL RECORDS (Cowan, 1940:567, unless otherwise noted).—California: Chuckwalla Mts. Baja California: San Felipe Bay; type locality; Laguna Hanson. California: Julian. Not found: Baja California: 20 mi. W Fort St. Louis; 40 mi. NW Fort San Luis; 8 mi. NW Fort San Luis; Aroyo [*sic*] Grande; Saltillo del Rey (Lydekker, 1913:115).

Ovis canadensis mexicana Merriam

1901. *Ovis mexicanus* Merriam, Proc. Biol. Soc. Washington, 14:30, April 5, type from Lago de Santa Maria, Chihuahua.
1901. *Ovis canadensis mexicanus* Lydekker, The great and small game of Europe, western and northern Asia and America, p. 11.
1907. *Ovis canadensis gaillardi* Mearns, Bull. U. S. Nat. Mus., 56:240, April 13, type from Gila Mountains, between Tinajas Altas and Mexican boundary, Yuma Co., Arizona.
1912. *Ovis canadensis texianus* V. Bailey, Proc. Biol. Soc. Washington, 25:109, June 29, type from Guadalupe Mountains, El Paso Co., Texas.
1916. *Ovis sheldoni* Merriam, Proc. Biol. Soc. Washington, 29:130, September 6, type from El Rosario, northern Sonora.

MARGINAL RECORDS (Cowan, 1940:552–554, unless otherwise noted).—Arizona: Colorado Canyon, Vitz's Crossing, 17 mi. N Pine Springs (Mearns, 1907:238); San Francisco Mtn. (*op. cit.*, p. 235). New Mexico: Zuni Mts.; Magdalena Mts.; Sheep Mtn. (V. Bailey, 1932:18); Guadalupe Mts. Texas: E rim above Frijole (Davis, 1940:84); Glass Mts. (Davis and Taylor, 1939:448); Boquillas Canyon (Borell and Bryant, 1942:44). Coahuila: approximately 5 mi. E San Lazaro (Baker, 1956:239). Chihuahua: Chihuahua. Sonora: Costa Rica Ranch; Rosario. Arizona: Gila Mts.; Black Mts. Not found: Arizona: Black Mesa of the Alamo.

Ovis canadensis nelsoni Merriam

1897. *Ovis nelsoni* Merriam, Proc. Biol. Soc. Washington, 11:218, July 15, type from Grapevine Mountains [high limestone ridge forming middle of range, about 5 mi. southerly from Grapevine Peak], on boundary between Inyo Co., California, and Esmeralda Co., Nevada, just south of lat. 37° N.
1898. *Ovis canadensis nelsoni*, Lydekker, Wild oxen, sheep, and goats of all lands, living and extinct, p. 208.

MARGINAL RECORDS (Cowan, 1940:563–565, unless otherwise noted).—Nevada (Hall, 1946:642): 28 mi. N Aus-

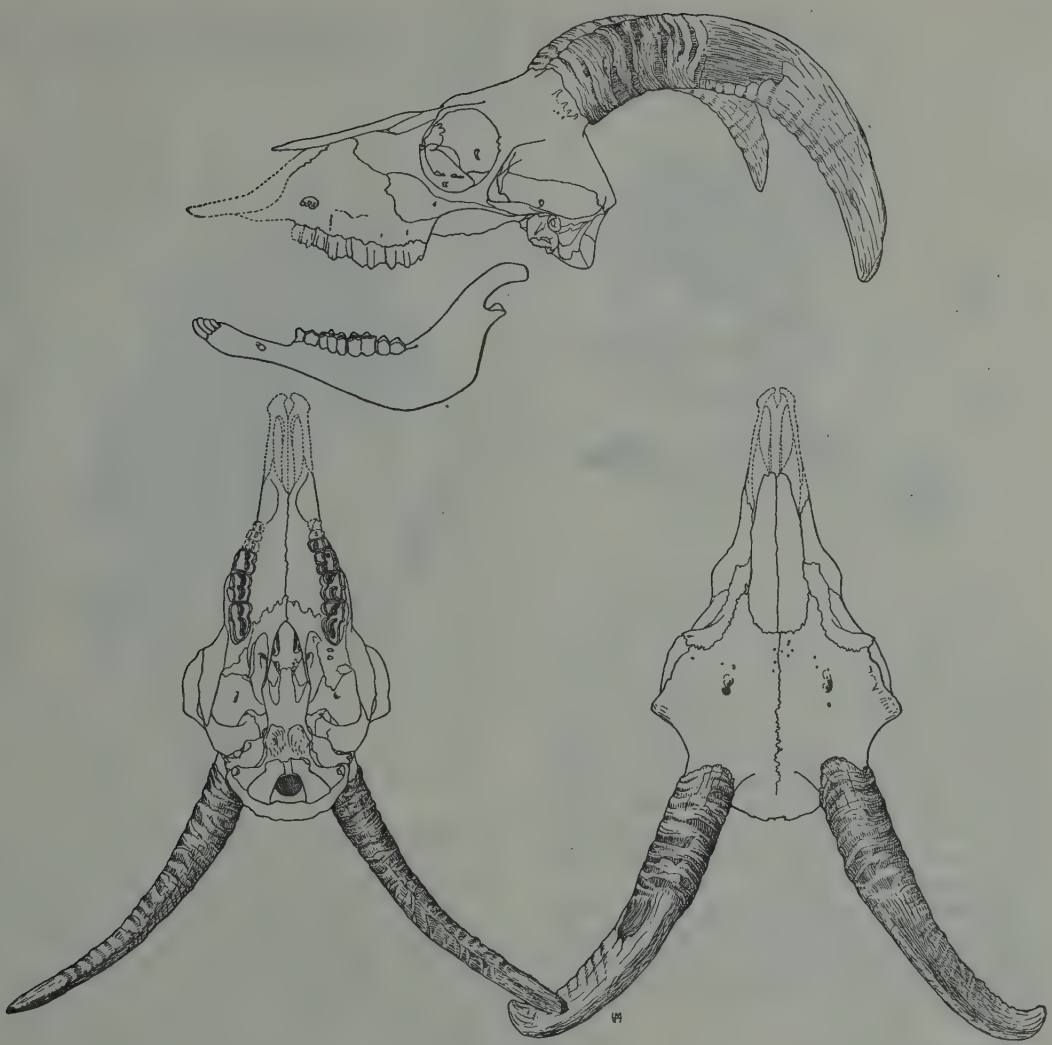


Fig. 537. *Ovis canadensis nelsoni*, 4 mi. E Boulder City, Nevada, No. 71803 M.V.Z., ♀ (but lower jaw is No. 2320 M.V.Z., ♀, from Deep Canyon, Santa Rosa Mts., Riverside Co., California) X ¼.

tin; 6 mi. NE Italian Spring, Quinn Canyon Mts., 7000 ft.; Irish Mtn. Arizona: Kanab Canyon; Toraweap, thence along west side of Colorado River to California: 20 mi. W Picacho; Canyon Springs, Chuckwalla Mts.; Santa Rosa Mts.; head Rock Creek, San Gabriel Mts.; Cuyama Plain, base White Mtn.; Caliente Peak, Cuyama Valley; W slope Inyo Range; W slope Sheep Mtn., White Mts.; Tin Mts.; Grapevine Mts. Nevada: Middle Fork of Cat Creek, 8900 ft. (Hall, 1946: 642).

Ovis canadensis weemsi Goldman

1937. *Ovis canadensis weemsi* Goldman, Proc. Biol. Soc. Washington, 50:30, April 2, type from Cajon de Tecómaja, 2000 ft., Sierra de la Giganta, about 30 mi. S Cerro de la Giganta, Baja California.

MARGINAL RECORDS.—Baja California: Sierra San Borjas, 20 mi. N Calmallí (Cowan, 1940:569); type locality.

Ovis dalli
Dall's Sheep

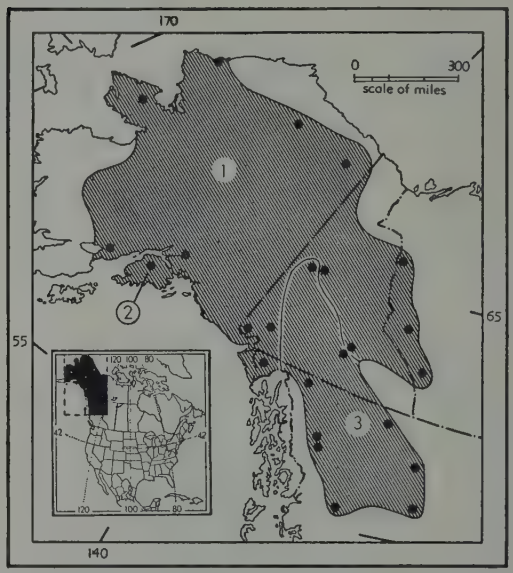
External measurements: (♂) 1300–1780, 75–115, 395–450; (♀) 1324–1377, 77–99. Weights to 91 kg. Basilar length of skull, (♂) 235–274, (♀) 215–238; zygomatic breadth, (♂) 114–134, (♀) 107–117; mastoid breadth, (♂) 82–97, (♀) 70–79; length of upper molar series, (♂) 68–88, (♀) 68–74. Upper parts pure white or Seal Brown, or Bone Brown, or Blackish Brown; underparts white; neck white or grizzled; face white to dirty white. Horns of adult males narrow at base to 15½ ins. in circumference, widespread to 34½ ins. from tip to tip. For comparison see *O. canadensis*.

Dall sheep inhabit the rugged mountain country of the Northwest where they feed on the meadow grasses. The mating season is from November to January, and the single offspring (2 are rare) is born in May or June.

Ovis dalli dalli Nelson

1884. *Ovis montana dalli* Nelson, Proc. U.S. Nat. Mus., 7:13, June 3, type from mountains S of Fort Yukon on west bank of Yukon River, Alaska; probably Tanana Hills.
1897. *Ovis dalli*, J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:112, April 8.

MARGINAL RECORDS.—Alaska: Cape Beaufort (A. M. Bailey and Hendee, 1926:23); Anaktuvuk Pass (Rausch, 1950:466); Romanzoff Mts. (Cowan, 1940:528). Mackenzie: Rockies, 66° N lat. (*ibid.*); mountains above Sekwi River and Dodo Creek (Rand, 1945a:51); South Nahanni River (Cowan, 1940:528). Yukon: Rose-Lapie Pass area (Rand, 1945a:51); Klondike River (Cowan, 1940:528); Kluane Lake (*ibid.*). British Columbia: St. Elias Range (Cowan and Guiguet, 1956:398). Yukon: St. Elias Alps, head White River, Mt. Logan (Cowan, 1940:528). Alaska: Knik River (Cowan, 1940:530); mountains near Iliamna Bay (Osgood, 1904:30); *Kuskokwim River* (Cowan, 1940:528); Berry Creek (*ibid.*).



Map 500. *Ovis dalli*.

1. *O. d. dalli* 2. *O. d. kenaiensis* 3. *O. d. stonei*

Ovis dalli kenaiensis J. A. Allen

1902. *Ovis dalli kenaiensis* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 16:145, April 23, type from head of Sheep Creek, Kenai Peninsula, Alaska. Regarded by Osgood, N. Amer. Fauna, 30:51, October 7, 1909, as identical with *O. d. dalli*; regarded as a valid subspecies by Cowan, Amer. Midl. Nat., 24:528, November, 1940.

MARGINAL RECORDS.—Alaska: Skilak Lake, Kenai Peninsula (Cowan, 1940:530), thence throughout Kenai Peninsula.

Ovis dalli stonei J. A. Allen

1897. *Ovis stonei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 9:111, April 8, type from Che-on-nee Mts., headwaters Stikine River, British Columbia.
1912. *Ovis dalli stonei* J. A. Allen, Bull. Amer. Mus. Nat. Hist., 31:28, March 4.
1898. *Ovis canadensis liardensis* Lydekker, Wild oxen, sheep, and goats of all lands, living and extinct, p. 215, type from Liard River, British Columbia.
1901. *Ovis fannini* Hornaday, Ann. Rept. New York Zool. Soc., 1900, Appendix 1:2, January 8, type from Dawson City, Yukon.

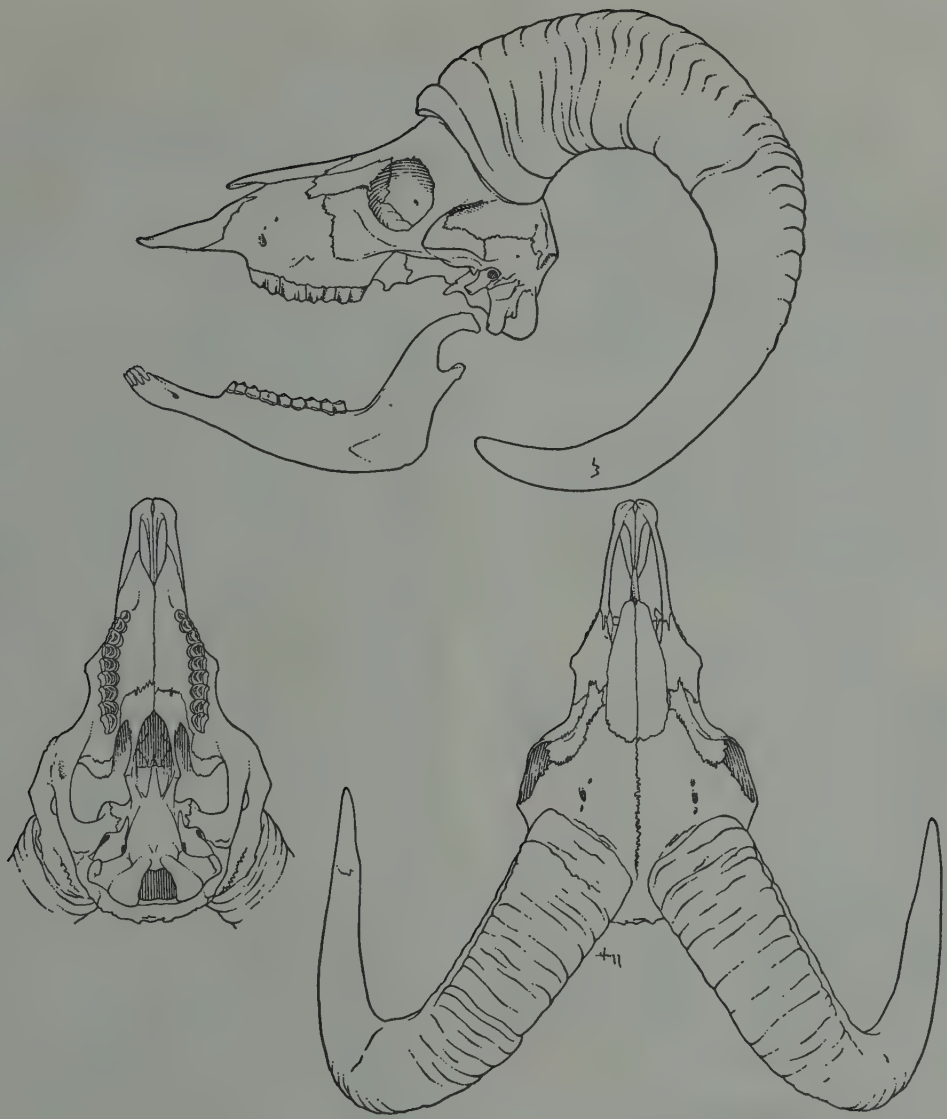


Fig. 538. *Ovis dalli dalli*, Knik River, Cooks Inlet, Alaska, No. 1845 K.U., ♂, X ¼.

1907. *Ovis cowani* Rothschild, Proc. Zool. Soc. London, p. 238, August 1, type from near Mt. Logan, British Columbia.

1915. *Ovis canadensis niger* Millais, *in* The gun at home and abroad . . . , p. 324, type from mountains at head of Skeena River, British Columbia.

MARGINAL RECORDS (Cowan, 1940:532, unless otherwise noted).—Yukon: Dawson; Pelly River. British Columbia: Summit Pass (Rand, 1944:49); Sikanni Chief River; Peace River on slopes bordering Nabesche River (Anderson, 1947:185); mountains at head Skeena River (Millais, 1915: 324); Iskoot Summit; Telegraph Creek; Lake Atlin (Anderson, 1947:185).

SUGGESTIONS FOR COLLECTING AND PREPARING STUDY SPECIMENS OF MAMMALS

In the first place the value of specimens is greatly enhanced by having them in excellent condition, and, of course, they must be accompanied by adequate data. Often a specimen may be well prepared and adequate data for it recorded, but subsequently, through faulty packing, incorrect method of labeling, or improper care and protection against pests and climatic conditions, it may be rendered worthless. Proper care at all stages of field work, therefore, is required to insure good quality in specimens. More details than are provided here on the techniques of preparing mammalian specimens are given in other authors' publications that can profitably be consulted. One of the best publications in this field is R. M. Anderson's "Methods of Collecting and Preserving Vertebrate Animals" (Bulletin No. 69, pages 1–162, illustrated, second edition, National Museum of Canada, March 22, 1944).

What to Collect

In preparing mammals caught, divide your efforts between common and rare species. As a rule, even with the more common species, save a pair from each locality. Series of up to thirty from one locality should be saved in each center of suspected differentiation—these to include young of different ages as well as adults.

Weathered skeletons or skulls of animals found may be desirable as specimens. For these, care must be taken to obtain all bones, and also teeth, as these frequently will have fallen out.

Contents of cheek pouches and samples of feces may be saved dry.

If lice, earwigs, flies, fleas, and other ectoparasites are to be preserved, it is desirable to examine not only the mammals but also their nests.

Plants to be saved should be placed in presses according to usual botanical practice. Seeds may be collected dry in any adequate containers.

Equipment and Proprieties

Mouse traps of the variety that snap shut on the animal can be purchased in almost every hardware store. These traps are satisfactory for shrews. For mice, however, the larger "Museum Special," manufactured by the Animal Trap Company of Lititz, Pennsylvania, is best because the wire that strikes and kills the mouse is far enough from the treadle to keep the head of the mouse from being struck and crushed. Broken skulls are less desirable than unbroken skulls. The still larger rat trap is stocked in most hardware stores and is suitable for taking animals the size of wood rats and small ground squirrels. Steel traps in sizes 0–4 are used in many areas to secure other animals. McAbee gopher traps are the best yet devised for taking pocket gophers. A variety of mole traps are on the market; the stabbing variety is preferred by most of the collectors that we know.

Many specimens are most effectively taken by shooting. For smaller and medium-sized kinds a shotgun is recommended, and, furthermore, shot of small size should be used in order to avoid unnecessary mutilation of the animal. For many years the double-barreled 16-gauge shotgun has been a favorite of collectors; it is customary to carry a standard 16-gauge shell in the left barrel and a metal bushing in the right barrel. The bushing is drilled to chamber a 32-caliber metal shell loaded with No. 12 shot. The collector is ready to shoot animals of fox- or eagle-size with the charge from the left barrel, or mice, chipmunks, or small birds with the charge from the right barrel.

Nets of silk, such as are manufactured in Japan, are useful to the mammal collector, especially in capturing several kinds of bats.

Metal forceps, 10 to 14 in. long, frequently come in handy when bats or other small mammals have to be removed from crevices.

For safely storing prepared specimens in accessible fashion, a museum cabinet that excludes insects, dust, and light is essential. A visit to the nearest museum maintaining a collection of study specimens of mammals, or a letter of inquiry addressed there, will yield all needed information on the type of container best suited to the needs of the collector. Advice concerning the cleaning of skulls can be obtained from the same source.

Every state has its own laws relating to hunting, and the collector should obtain and read the laws so as to carry on his collecting in conformance with the law. The State Fish and Game office can provide a copy of the laws, and that office, in most states, is the place to apply for a "scientific collecting permit." The collector should also find and inform the local game protector of proposed collecting, because this can be of mutual benefit; the collector often receives valuable advice as to where certain species occur locally, and the Game Protector needs to know who is afield in his area and oftentimes obtains information valuable to him from the catches of the collector.

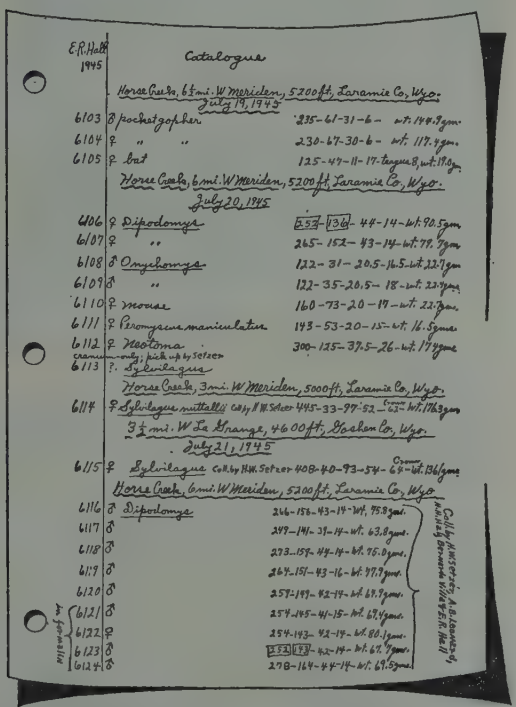
Wherever animals are collected on privately owned lands the permission of the land owner or his tenant must be obtained in advance. Application of the Golden Rule with land owners and the Game Protector will avoid trouble for the collector and bring him welcome assistance.

NOTE-TAKING

Field notes can usefully be divided into: (1) catalogue of specimens, (2) itinerary or journal, (3) accounts of species. Enter the name of the collector and the year in the upper left-hand corner of every page, but far enough from the margin to permit binding of the pages. Each page should be filled before another page is started. Use only Higgins Eternal Black Ink. For convenience all three sections of the notes ordinarily are kept in a single binder, but separate binders may be used.

CATALOGUE

In the catalogue, all specimens of vertebrate animals should be given consecutive numbers. Never repeat a number; for instance, do not begin a new series each year. One line of the notebook page should be devoted to the precise locality. Include distance in air-line miles from some well-established landmark. Include also elevation, county, and state. Devote one line to each specimen. If a specimen is not a conventional one, indicate the nature by entry directly above the field number, whether (if) skeleton, skull-only, skin-only, or alcoholic. Use the vernacular name of the species if you are not *sure* of the scientific name.


E. R. Hall 1945

Catalogue

Horse Creek, 6½ mi. W Meriden, 5200 ft., Laramie Co., Wyo.
July 19, 1945

6103 ♂ pocket gopher · 235-61-31-6- wt. 148.9 gm.
6104 ♀ " " 230-67-30-6- wt. 117.4 gm.
6105 ♀ bat 125-47-11-17- tongue 8, wt. 11.0 g.

Horse Creek, 6 mi. W Meriden, 5200 ft., Laramie Co., Wyo.
July 20, 1945

6106 ♀ Dipodomys 253-136- 48-14- wt. 90.5 gm.
6107 ♀ " 265- 152- 43-14- wt. 78.7 gm.
6108 ♂ Onychomys 122- 31- 20.5-16.5- wt. 22.7 gm.
6109 ♂ " 122- 35-20.5- 18- wt. 22.7 gm.
6110 ♀ mouse 160-73-20-19- wt. 22.3 gm.
6111 ♀ Perognathus maniculatus 193-53-20-15- wt. 16.5 gm.
6112 ♀ Neotoma cranium only; pick up by Setzer
6113 ?. Sylvilagus

Horse Creek, 3 mi. W Meriden, 5000 ft., Laramie Co., Wyo.

6114 ♀ Sylvilagus nuttalli Coll. by H.W. Setzer 445-33-97-52 wt. 1762 gm.

3½ mi. W La Grange, 4600 ft., Goshen Co., Wyo.
July 21, 1945

6115 ♀ Sylvilagus Coll. by H.W. Setzer 408-40-93-54- wt. 1364 gm.

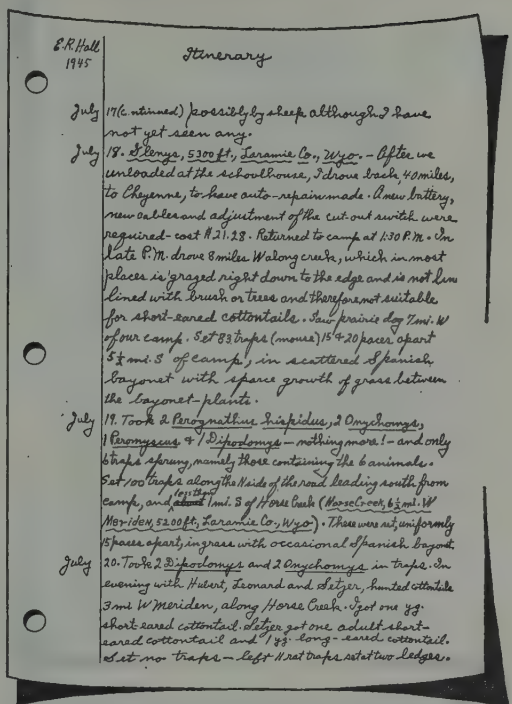
Horse Creek, 6 mi. W Meriden, 5200 ft., Laramie Co., Wyo.

6116 ♂ Dipodomys 246-156-43-19- wt. 95.8 gm.
6117 ♂ 249-141-31-14- wt. 63.8 gm.
6118 ♂ 273-159-44-14- wt. 76.0 gm.
6119 ♂ 264-151-43-16- wt. 77.7 gm.
6120 ♂ 257-149-42-14- wt. 69.9 gm.
6121 ♂ 254-145-41-15- wt. 67.4 gm.
6122 ♀ 254-143-42-14- wt. 80.1 gm.
6123 ♂ 252-137-42-14- wt. 67.7 gm.
6124 ♂ 278-164-44-14- wt. 69.5 gm.

Collected by H. Setzer, A. Holmes, and E. R. Hall

Fig. 539. A page from a field catalogue, slightly less than one-half natural size. Blue horizontal lines fail to show in this photograph.

ITINERARY


E. R. Hall 1945

Itinerary

July 17 (continued) possibly by sleep although I have not yet seen any.

July 18. Elenza, 5300 ft., Laramie Co., Wyo. – After we unloaded at the schoolhouse, I drove back, 40 miles, to Cheyenne, to have auto-repairs made. A new battery, new cables and adjustment of the cut-out switch were required – cost $21.28. Returned to camp at 1:30 P.M. In late P.M. drove 8 miles W along creek, which in most places is grazed right down to the edge and is not lined with brush or trees and therefore not suitable for short-eared cottontails. Saw prairie dog 7 mi. W of our camp. Set 83 traps (mouse) 15 by 20 paces apart 5½ mi. S of camp, in scattered Spanish bayonet with sparse growth of grass between the bayonet-plants.

July 19. Took 2 Perognathus hispidus, 2 Onychomys, 1 Peromyscus & 1 Dipodomys – nothing more! – and only 6 traps sprung, namely those containing the 6 animals. Set 100 traps along the sides of the road leading south from camp, and about 10th mi. S of Horse Creek (Horse Creek 6½ mi. W Meriden, 5200 ft., Laramie Co., Wyo.). These were set uniformly 15 paces apart, in grass with occasional Spanish bayonet.

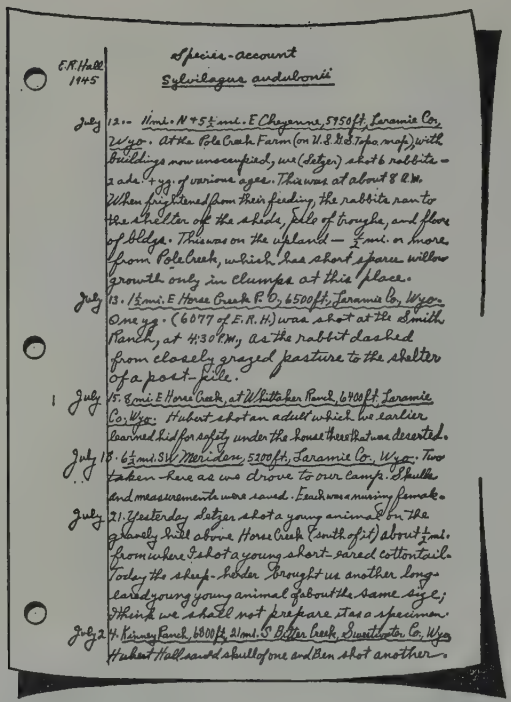
July 20. Took 2 Dipodomys and 2 Onychomys in traps. In evening with Hubert, Leonard and Setzer, hunted cottontails 3 mi. W Meriden, along Horse Creek. Got one ♀ short-eared cottontail. Setzer got one adult short-eared cottontail and 1 ♀ long-eared cottontail. Set no traps – left 11 rat traps set at two ledges.

Fig. 540. A page from a field note book, slightly less than one-half actual size. Blue horizontal lines fail to show in this photograph.

On the first line of the itinerary enter date and locality. Follow with a concise account of route and travel area and habitats studied, and record number and kinds of traps set, distance between traps, number of vertebrates collected, as well as other pertinent information—for example, record number of traps set in each type of vegetation and numbers and kinds of animals caught therein. Section, township, and range comprise useful information.

ACCOUNTS OF SPECIES

Accounts of species should be headed with either the scientific or common name, as preferred. The date and locality for the account should be given on the first line. Only one species should be written about on a single page. Information in the account should not be a repetition of material given in the itinerary or journal. Do not only include facts, but make interpretations and generalizations. The accounts should be written in a style suitable for quoting in any publication. Accounts of species need not be restricted to kinds collected. If the account is about animals collected, it is wise to refer to the animals by your field numbers.


E.R. Hall
1945

Species-account
Sylvilagus audubonii

July 12.- 11mi. N + 5½ mi. E Cheyenne, 5750 ft, Laramie Co, Wyo. At the Pole Creek Farm (on U.S. Geol. Topo. map) with buildings now unoccupied, we (Setzer) shot 6 rabbits - 2 ad. + yg. of various ages. This was at about 8 P.M. When disturbed from their feeding, the rabbits ran to the shelter of the sheds, pile of troughs, and floor of bldgs. This was on the upland — 2 mi. or more from Pole Creek, which has short sparse willow growth only in clumps at this place.

July 13. 1½ mi. E Horse Creek P.O., 6500 ft, Laramie Co, Wyo. One yg. (6077 of E.R.H.) was shot at the Smith Ranch, at 4:30 P.M., as the rabbit dashed from closely grazed pasture to the shelter of a post-pile.

July 15. 8 mi. E Horse Creek, at Whitaker Ranch, 6900 ft, Laramie Co, Wyo. Hubert shot an adult which we earlier learned had for safety under the house there that was deserted.

July 18. 6½ mi. SW Meriden, 5200 ft, Laramie Co, Wyo. Two taken here as we drove to our camp. Skulls and measurements were saved. Each was a nursing female.

July 21. Yesterday Setzer shot a young animal on the gravelly knoll above Horse Creek (south of it) about ½ mi. from where I shot a young short-eared cottontail. Today the sheep-herder brought us another long-eared young young animal about the same size; I think we shall not prepare it as a specimen.

July 24. Kinney Ranch, 6800 ft, 21 mi. S Bitter Creek, Sweetwater Co, Wyo. Hubert Hall saved skull of one and Ben shot another.

Fig. 541. A page from a field note book, slightly less than one-half natural size. Blue horizontal lines fail to show in this photograph.

Head each notebook page with collector's name and year, page number (if number system is used), locality (in *detail* the first time used), and date.

Write *full* notes, even at risk of entering much information of seemingly little value. One cannot anticipate the needs of the future, when notes and collections are worked up. The following are suggested topics, but do not restrict yourself to these alone. Be alert for new ideas and new facts.

Describe vegetation (saving plant-press samples of species not positively known), nature of ground, slope exposure, and drainage in each belt of animal life sampled. Describe exact location of trap lines, referring to your topographic maps, and also enter a sketch, in profile or surface view or both, to illustrate the location and relations of the different habitats crossed. Properly marked maps for each region worked should ultimately be bound in with the field notes of at least one member of your field party.

Keep record of closeness of settings of traps, distance covered, and results of each night's trapping; give number and type of traps put out in each habitat and number of animals of each species captured in each habitat (whether or not preserved). In some instances it is advisable to record the sex, age, and breeding condition of each animal.

Keep full record of breeding data: number and approximate size (length) of embryos or of young found in nests. Dig out burrows if practicable; make drawings to scale, showing plan, and elevation; describe fully.

Record food plants; keep specimens for identification where not known by a definite name; preserve contents of cheek pouches and stomachs. If these are not saved, identify and record contents.

Note regularly in notebook all "pick-ups," that is, odd skulls or fragments of animals of whatever sort or source, serially numbered along with specimens of the more usual sort. Give full information, as with odd skulls secured from trappers. Label all such specimens adequately, as elsewhere described.

When leaving a well-worked locality, enter a summary of species observed, with remarks of a general nature, relating to local conditions of terrain, human activities, and other pertinent conditions.

Where feasible, interview old residents, trappers, National Forest and National Park rangers in each locality visited. Always record accurately the name, official position or occupation, and address of each person giving information; also give your opinion as to his reliability. Note general attitude of persons interviewed as to game laws, conservation, and effects of settlement by Man, and record specific comments, complaints, or criticisms.

Ascertain present numbers and distribution of large mammals as compared with their former status. So far as is possible get definite statements expressing ratio of present abundance compared with a definite number of years back. Seek such information, where feasible, by indirect query. Do not risk influencing your informant's statements by leading questions. Record fully all evidence as to human influence upon original or "natural" balance. Record present economic relations of vertebrate animal life, that is, effect on agriculture and stock-raising, with full details. Note opinions of persons interviewed as to whether species should be protected or destroyed. Describe local methods of capture or destruction; give your opinion as to their effectiveness and justification.

Opportunity offering, record detailed observations on effects upon vertebrate animals of: severe storms; floods; forest, brush, or prairie fires; overgrazing; tree-cutting; road-building; or tree-planting.

Labeling of Specimens

Use one serial set of field numbers for *all* specimens (including "pick-ups," wet preservations, and ectoparasites).

Of course every specimen is to be fully labeled at the time it is prepared—and before the preparation of another is begun. A complete, authentic label for a mammal in most instances is scientifically more valuable than the skin to which it is attached. Beginners may not realize the prejudice engendered in careful zoologists by sight of a specimen incompletely labeled or of a specimen with a complete label unattached or insecurely attached to the specimen.

For each specimen always give altitude and county as well as exact place; for example: "3 mi. NE Lone Star, 850 ft., Douglas Co., Kansas." Attend minutely to proper punctuation. If not true NE, give miles north and miles east. Distances always to be air-line. Locality data to be given in notebook precisely as on specimen label.

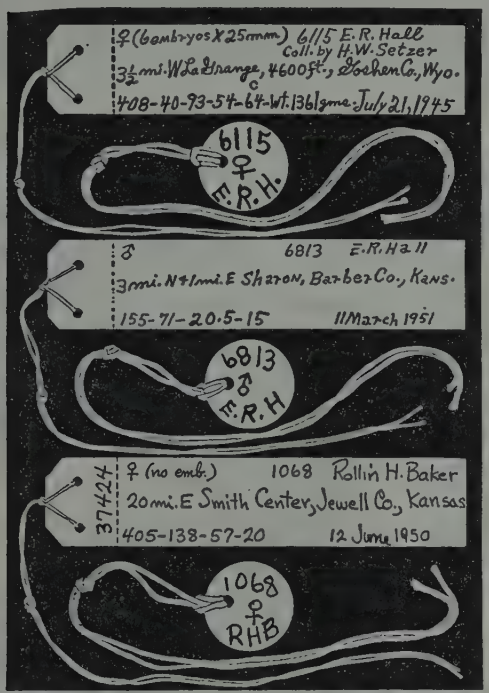

♀(6embryos X25mm) 6115 E.R. Hall
Coll. by H.W. Setzer
3½ mi. W La Grange, 4600 ft., Goshen Co., Wyo.
408-40-93-54-64-Wt. 136 gms. July 21, 1945
6115 ♀ E.R.H.
♂ 6813 E.R. Hall
3 mi. N 1 mi. E Sharon, Barber Co., Kans.
155-71-20.5-15 11 March 1951
6813 ♂ E.R.H
37424
♀ (no emb.) 1068 Rollin H. Baker
20 mi. E Smith Center, Jewell Co., Kansas
405-138-57-20 12 June 1950
1068 ♀ RHB

Fig. 542. Labels, fully filled out. The larger labels are for stuffed skins; the smaller labels are for uncleaned skulls. X ¾.

Record data on labels for skins on one side only (the opposite side is left blank for entering the name in eternal ink after laboratory studies have been completed). Enter data on three or four lines as may be necessary, and in the order indicated below.

On the first (top) line record sex (if female, record number and size of embryos or absence of embryos), collector's field number, and collector's name. Immediately following the field number record the name of the person to whom the number pertains, and preface the name of the second person with "Coll. by" or with "Prep. by" for the purpose of insuring that the field number will be associated only with the name to which it pertains and also to show which person was the collector and which one was the preparator. This information is important and especially so when necessity arises for tracing back through the field notes (catalogue, species account, or itinerary) to obtain supplementary information.

On the second line, or on the second and third lines, record the locality exactly as in the catalogue and other parts of the field notes—even to punctuation and abbreviation.

On the last line, record total length, length of tail, length of hind foot, height of ear from notch, weight in grams, and date. Use dashes (not commas, periods, colons, or semicolons) to separate the measurements. Use the abbreviation "gms." after the weight to show that the weight is recorded in grams instead of in grains or in ounces. Write out the names of months that are no longer than five letters; abbreviate the names of the others. Never use a numeral to represent the month, because doing so increases the chances of error in later transcriptions of the month and day. For example, depending on the country from which a person comes, the date of June 9, 1953, is written in at least the following forms: VI-9-1953, 6-IX-1953, 6-9-1953, VI-IX-1953, 9-6-1953; still other combinations are possible and may be used; even within different parts of one country (the United States) the form varies. Any one of the above combinations of numerals means Sept. 6, 1953, to some persons and June 9, 1953, to other persons; consequently it should be written "June 9, 1953" or "9 June 1953" in order to avoid error. Also use four numerals for the year (1953) and not an apostrophe and two numerals ('53) because the apostrophe can waste valuable time of the zoologist in ascertaining whether 1753, 1853, or 1953 is correct.

On a skull-tag enter field number, initials, and sex symbol with Higgins Eternal Ink; write *'large* and *heavy'* to prevent fading of the number and consequent loss of a specimen.

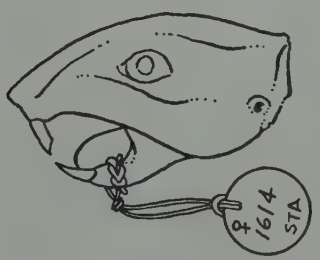


Fig. 543. Skull-label correctly tied to one ramus of the lower jaw of a skull freshly skinned out, and immediately before immersion in water. X ¾.

Attach tag to skull by running the string between the *lower jaws.* Tie with about ¼-in. slack in the string. Do not tie tightly around the lower jaw; there is danger of breaking the jaws of bats or shrews. Also, a loose string allows the larval dermestids to eat the meat directly between the string and jaw bone. Cut off the loose ends of the string.

All miscellaneous material should bear labels with notebook references by specimen numbers, and initials of collector. Nests should be "threaded" and have labels attached to them (not only to container). Folders for plants should each be inscribed with full data, according to usual botanical practice.

LABELS

Labels for skins. Paper used as labels should last for centuries, take ink well, hold ink well even when labels are immersed in liquids, and retain its strength in water or formalin or alcohol. At the Museum of Natural History of the University of Kansas we use, as best meeting the requirements mentioned above, "Resistall Index, Bristol 100 per cent rag." This paper has a weight of 110 lb. From sheets 25½ × 30½ in. we cut out the labels, after printing, that are to be attached to skins.

Stacks of 50 labels are firmly held in a metal frame of appropriate size, and two holes are drilled by means of a bit in a drill press near one end of the stack of labels. See figure 542 for exact position of the two holes.

For threading the labels we use Star Brand, white, 6-strand, mercerized, size-10 cotton thread manufactured by the American Thread Company. This thread comes in spools of 150 yd. to the spool. For stringing one label a piece of thread 330 mm. long is used. After the thread is strung through the two holes in the label, the loose ends of the thread are strung through a half-turn loop taken in the thread of the "backside" of the label. The threads are pulled taut, and a knot is tied in the two threads exactly one inch from the end of the label. This label and thread are recommended as satisfactory in all respects save one. The size of our label, in our opinion, is too large (see Figure 542). A width of 15 mm. and a length of 70 mm. would suffice. Predecessors established the size now used at the University of Kansas, and we continue to use it because the advantages of uniformity within a single collection outweigh the advantages that would be gained by changing to another size.

Threading of the labels is done by hand. A smooth flat board, say, 4 × 8 in., with the point of a finishing nail showing on one side at a distance of 1 in. from an ink mark facilitates tying the knot at the correct distance from the edge of the label. A skillful person can thread and tie 200 to 300 labels an hour.

Labels for skulls and skeletons are of a diameter (19 mm.) that fits loosely in the bottom of the smaller of the two sizes of glass vials used for housing skulls. These round labels are "Fiber Water Proof Stock, 10 pt." purchased from the Dennison Manufacturing Company of St. Louis, Missouri. The labels are perforated at one side and are strung with No. 5 linen twine, in which a knot is tied exactly 1 in. from edge of label (see Figures 542 and 543). If pressure is exerted when writing on these labels, the writing will be retained even though the labels are immersed in water, ammonia, or alcohol. This fiber stock yields labels that are resistant to dermestid beetles and their larvae—insects used to remove flesh from the osteological specimens to which these round labels are attached. Some other kinds of paper are eaten by dermestids if the paper becomes stained with blood.

Notebook paper that is high in rag content is used because its lasting qualities are thought to be superior to most other kinds of paper. Field notes containing observations of behavior of animals written "on the spot," and census counts of animals under natural conditions in areas that later are greatly modified by Man, have increasing value with the passage of time. Such records, therefore, should be on paper that will not deteriorate with age.

SKINNING AND STUFFING SMALL MAMMALS

Tools and supplies normally used are as follows:

Labels for skins
Labels for skulls
Higgins Eternal Ink (not Higgins Drawing Ink or Higgins India Ink)
Dip pen or fountain pen in which Higgins Eternal Ink can be used
30-cm. rule graduated in millimeters
Sewing needles
White (not colored) cotton thread, 2 sizes
Pliers with clean-cutting jaws and wire-gripping ends on jaws
Forceps with fine sharp points but having arms strong enough to permit of gripping solidly
Scalpel or razor-sharp knife blade
Carborundum sharpening stone
Scissors, surgical-type, with two sharp points
Cotton, long-fibered, resilient, in smooth bats
Arsenical powder or soap in wide-mouthed container
One shallow pie tin
White cornmeal or fine hardwood sawdust

Other supplies and equipment are optional and may include scraper for removing fat and a 3-cornered file for working metal.

Measure the mammal in millimeters and weigh it in grams. Experienced preparators take two measurements, write them on the label, take two more measurements, write them on the label, weigh the animal, and write the weight on the label.

The standard measurements for a study specimen are taken as follows:

Total length. Manipulate mammal so that it lies out straight (do not stretch it; guard against error that can result from a broken vertebral column), and measure distance from tip of nose-pad to tip of fleshy part of tail, excluding hairs that project beyond tip.

Fig. 544. Measuring total length of a small mammal. X ½.

Length of tail. Bend tail up at right-angle with body and measure from bend on back to tip of fleshy part of tail, excluding hairs that project beyond tip.

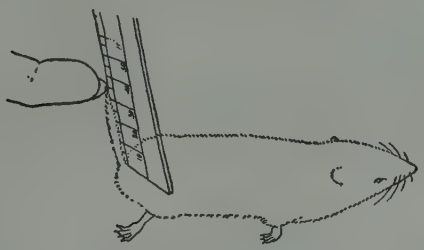


Fig. 545. Measuring length of tail of a small mammal. X ¼.

Length of hind foot. With its toes out straight measure the distance from tip of longest claw to heel—in the same way that the over-all length of a person's foot would be measured. Outside of North America the claw is excluded from the measurement of the length of the hind foot, and only the fleshy part of the foot is measured in mammals from continents other than North America (Greenland, Panamá, and Central America are parts of North America).

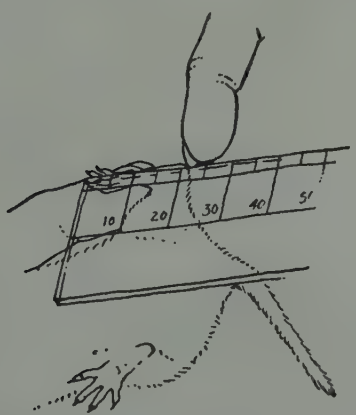


Fig. 546. Measuring length of hind foot of a small mammal by means of a transparent (plastic) rule. X ¾.

Height of ear from notch. Insert end of rule in notch at bottom of ear and measure to distalmost border of fleshy part of ear.

Next make out the labels (for skin and skull), and then make the entry in the field catalogue. It may be necessary to enter the sex (and certainly number and size of embryos if any) after the animal is skinned.

Fold a square piece of cotton or other stuffing to desired size and shape, and lay it to one side. A body too large or too small will cause trouble. A body wider than high and wider at the middle than at either end, to begin with, gives best results. Make the body one-fourth longer than the body of the animal (the extra fourth will be cut off later). The back and sides of the body should be smooth; small irregularities in the body make larger-appearing irregularities in the dried specimen. The outside edge of the cotton should be feathered; that is to say, enough of the fiber should be removed to make the cotton taper to a thin edge. When the last fold is made, drag the body across the skinning board or table top so as to cause the thin edge of the cotton to adhere to the previous layer. So doing will prevent the body from unrolling while the skin is being turned over it; partial unrolling twists the skin, making it unsightly. The aim, whatever method is adopted for forming the body, is to obtain a symmetrical, firm, yet resilient body that will retain its shape while the skin is drying.

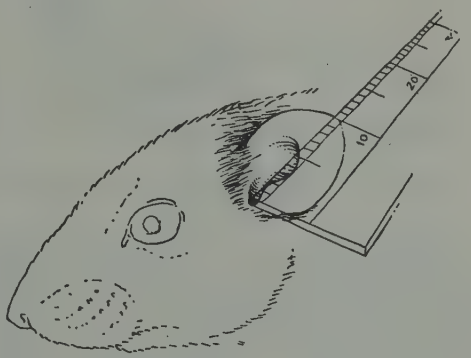


Fig. 547. Measuring height of ear from notch in a small mammal. X 1½.

After the body is made, select monel metal wire of appropriate gauge; with pliers holding one end of the wire stretch a piece until it is perfectly straight. Cut and lay to one side five pieces, one piece for the tail and four pieces for the four legs. A leg-wire should be as long as the bony structure of the limb; wires for the two hind legs should be longer than those for the front legs. The tail-wire should be a half longer than the tail. For pocket gophers and wood rats use No. 20 wire; for a larger *Peromyscus* use No. 22; for small pocket mice use No. 24; for tails of the smallest bats use No. 24 or even No. 26 wire. Monel metal wire, or annealed tin wire, is to be used. Do not substitute other kinds of wire (not even copper, brass, or galvanized wire), because those eventually corrode or rust and destroy the specimen. If the correct kind of wire is not available, use split bamboo instead, and in any event use bamboo or other straight-grained, tough wood in place of wire in the legs of mammals larger than wood rats. Striped skunks and other mammals of equal and smaller size are to be stuffed; badgers, foxes, and larger animals are skinned so that the hides can be properly tanned and preserved unstuffed.

Have ruler, threaded needle, scalpel, forceps, scissors,

arsenic container, and pie tin containing a double handful of sawdust or cornmeal before you on a table or on a flat skinning board supported on the arms of a camp chair.

With the mammal held, back down, on the sawdust in the pie tin, use the scissors to cut the skin, and if possible not the body wall, on the midline of the belly from immediately in front of the anal opening forward one-fourth the distance (no more) toward the chest. Experience will enable you to make this cut by means of no more than two snips of the scissors, and to cut only the skin and not the body wall. Retain the scissors on the thumb and finger of one hand while proceeding so as not to waste time in laying down and picking up the instrument each time that it is needed.

Fig. 548. Making initial incision in skinning a small mammal. X ⅔.

With the free hand sweep sawdust onto the cut area. With the third and fourth fingers of the hand holding the mammal, thrust the knee toward the midline of the body, meantime pushing the skin of the belly and flank away from the midline by means of the thumb of the same hand. Grasp the exposed knee with the scissors hand, and with the forefinger and thumb of the other hand separate the leg from the shin and push the skin all of the way down to the ankle. Insert a blade of the scissors at the ankle in such a way that the bones of the lower leg are between the blades of the scissors, and in one motion by means of the blades of the scissors strip the flesh from the lower leg and free the lower leg by cutting it immediately below the knee joint. Repeat the process on the other hind leg.

Fig. 549. X ⅔ [skinning out hind leg].

One reason for leaving the bones of the lower leg attached to the skin, instead of severing the hind leg by cutting through the ankle, is to meet the need that sometimes arises to measure the length of the dry hind foot. If the bones of the lower leg are present, the heel can quickly and certainly be located. If the bones of the lower leg are not present, there will be uncertainty concerning the heel: Was it cut away with the bones of the lower leg? If the heel is located, is all of it present? To answer such a question, it is necessary to relax the skin of the hind foot, cut the skin, and visually inspect the bones. These time-consuming operations can be avoided by leaving the bones of the leg in the skin.

Meanwhile, and throughout the whole of the skinning, keep the specimen buried as much as possible in sawdust, because the sawdust absorbs fat and any other body fluids, thus preventing them from getting on the fur or on the hands of the preparator. If the fat gets on the hands of the preparator, it will be transferred to the fur. Fat on the fur makes the pelage unsightly and spreads eventually to the label and other specimens; fat anywhere on the preparation oxidizes and in time destroys the skin. To keep the specimen immersed in sawdust (or white corn meal) requires that the preparator learn to work as much as possible by touch instead of by sight. Beginners seldom use enough sawdust. The thought that "if some is good more is better" really applies to the use of sawdust in skinning mammals. After eight to ten small mammals that are exceptionally fat are skinned in a small quantity of sawdust, it becomes saturated with grease. Discard it and use fresh sawdust.

When the two hind legs have been freed and skinned out in the manner described above, separate the skin from the body wall by working a finger, or the handle of a scalpel, between the skin and the body. With the fingernails sever the gut and associated connections of the skin to the body. Scissors or scalpel can be used, but time is saved by using the fingernails. When the skin is free all around the base of the tail, place three fingernails behind the skin and push it off the tail. One motion will do the job. Take care to keep the nails against the tail vertebrae and behind the skin so as to avoid the misfortune of having the skin of the tail turn inside out; this misfortune slows down even the experienced preparator and is one that may be insurmountable for the beginner.

When the skin is free from the tail and hind legs, separate the skin from the body wall at the anterior end of the initial incision that was made on the belly. Then turn the skin down all around the body and push (don't pull) it off the body. Be sure that the skin is reflected (turned down) on the belly as well as elsewhere; otherwise the skin will gradually tear forward from the front end of the initial incision on the belly as you proceed with the skinning, and that misfortune causes the skin to fit improperly on the cotton body, with the result that the dried skin of the specimen will be misshapen. Push the skin down until the mammal's elbows are in sight. Tear or cut the thin skin-muscle that shows up. Push the skin down to the wrist. Straddle the forearm near the wrist with the blades of the scissors; in bringing the blades of the scissors up from the wrist almost to the elbow, strip the flesh from the lower leg and cut the bones immediately below the elbow joint. Do the same with the other foreleg. Drop the scissors, because you will not need them again in skinning this mammal. Push the skin farther until the bases of the ears come into view. By means of the fingernails securely grasp the ear

tube on two sides where it emerges from the bone and pull the tube free. When the two ears are free, push the skin forward until the eyes are reached. Pick up the scalpel or knife and make two cuts on each eye: one cut straight down across the eye to sever most of the attachments of the skin to the skull, and a second cut on a transverse plane, with the blade of the scalpel against the bone so as to sever the lower (front) angle of the eye from the skull. Care has to be used in making the last cut, or the lids at the angle of the eye will be cut, with the result that the eye opening will be unnaturally large in the stuffed skin.

Push the skin to the tip of the lower jaws, sever the skin of each cheek, and then separate the skin from the front of the jaw by means of three slices of the scalpel or by means of three tears made with the fingernails. By means of the thumbnail push the skin on each side of the rostrum (forepart of the skull) to the tip of the nose. Cut the skin free by a stroke of the scalpel, taking care to cut well ahead of the tips of the nasal bones. Beginners often cut off the ends of the nasal bones and are especially apt to do this if scissors are used instead of a scalpel.

With experience, less than a minute should be required to skin a mouse; that is to say, no more than a minute need elapse from the instant when the first incisior (cut) is made on the venter until the skin is freed from the tip of the nose.

Note the sex. If the specimen is female, note the absence or presence of embryos. If embryos are present, note the number and length from crown to rump. Complete entries on labels and in catalogue. Attach the skull-label to the skull and drop it in water.

With scalpel in hand go over the skin, laid flat on the sawdust, to remove any fat. Remove it all. Fascia or small bits of red muscle are not worth removing. Grasp threaded needle; sew up mouth with a triangular stitch, and secure with a knot to prevent the stitch from coming loose. Cut the thread above the knot. Tie a knot with one hand at the end of the thread, and place threaded needle where you will reach for it the next time it is needed. To all parts of the flesh-side of the skin now apply arsenical soap by means of a brush, or apply powdered arsenic by means of a wad of cotton held in forceps.

Fig. 550. X 1 [sewing of lips].

In each foreleg thrust a wire along the bone of the foreleg into the palm and to the base of the nail of the middle finger without perforating the skin. Begin at the wrist with a thin wisp of cotton, and wrap the bone of the lower leg and wire firmly together. Moistened fingers will secure the cotton at the upper end of the wrapping. The foreleg shaped from cotton should be smaller than the original foreleg.

With the forceps pick up a cotton body. Place the outer seam down. By means of the closed forceps press down on the center of one end of the roll of cotton; with a finger and the thumb of the free hand press inward each side of the cotton at the same end; maintain pressure of the thumb and finger on the two sides of the

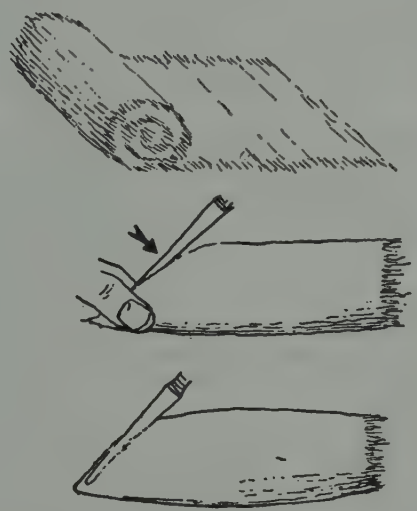


Fig. 551. Folding cotton to make a body, and shaping the end of the body by means of forceps and thumb and forefinger so that the body will fit properly in the nose of the skin. X ½.

end of the body; transfer the forceps, now opened, to the outside of the finger and thumb, and by means of the forceps constrict the cotton. Repetition of the maneuver forms a firm, sharp-pointed, symmetrical end, pointed downward. Holding this pointed end by means of the forceps, place the nose-pad of the skin (still flesh-side out) against the pointed end of the cotton body; turn the skin over the cotton body as far as the forelegs, meanwhile maintaining the grip with the forceps on the pointed end of the cotton; set in place the skin of the head and neck by tugging (not strongly enough to tear it) at the skin in the area of each eye, the skin of the throat, the skin around each ear, and the skin of the chest, making certain that the hard pointed nose of cotton is all the way to the tip of the nose, that the two eye openings are symmetrically set, that the ears are exactly opposite each other, and that the skin of the

head is fully stuffed. Then release the grip of the forceps. If the head end of the cotton body was correctly formed the cotton will expand and thus fill out the skin of the head and cause it to be bilaterally symmetrical.

Handling the body and skin as little as possible, turn the remaining part of the skin over the body, which should be slightly longer than the natural body. With scissors cut off the surplus end of the body but leave a thin extension on the back (top) side. See that the cut is exactly vertical and exactly transverse. Let the thin extension of cotton from the back cover the cut end.

Rotate each hind foot one-half turn outward. Then wire each hind leg in the fashion described above for the forelegs. Pull the hind feet out behind. The soles should be down. The skin of the hind leg should be stuffed so that the circumference of the lower leg and thigh is the same as it was in life. The wrapping that binds the wire and bone of the lower leg together should be long enough and frayed enough at the upper (proximal) end to make a gradual blend with the cotton body.

Pick up the tail-wire, moisten one end, twirl (by rotating the wire) on a thin strand of cotton, continue twirling so as to wrap a strand of cotton of gradually increasing diameter on the wire. The tail on the skinned body is a pattern for size. Remember that projecting ends of fibers cause the artificial tail to be functionally larger than it appears to be. Consequently, the wrapped tail-wire should seem to be of a slightly lesser diameter than the actual tail that has been slipped out of its skin. If the cotton is firmly anchored at each end of the tail-wire and if the diameter is exactly correct, all will go nicely. Hang the unstuffed tail down over the near edge of the skinning board (or table), dust some arsenic on the artificial tail, place the tip of the tail-wire into the open base of the tail, and then in one continuous movement thrust the tail-wire all the way to the tip of the skin of the tail—almost to the tip is not sufficient, because any unstuffed part will wither and be broken off.

With wire cutters snip off only as much of the free end of the wire as can not be got through the slit in the skin of the belly. The wire should lie on the midline of the underside of the cotton body between it and the skin.

Adjust the four legs so that the pairs are symmetrically placed and so that the leg-wires lie parallel to the midline and as close to it as tension on the skin will permit. See that the tail-wire is lined up properly—parallel with the leg-wires and on the midline of the belly midway between the wires of the two hind legs. All of this should be done without picking up the stuffed skin; unnecessary handling at this stage makes the body misshapen. Next sew up the slit in the belly. This is to be done by first catching the very edge of the cut edge of the skin with the needle; three or four diagonal cross-stitches should suffice. After the last one is taken, pull the whole lot tight; throw a loop in the thread, and by means of the points (closed) of the scissors run the loop down to the fur side of the skin to form a knot that prevents the stitches from pulling out as the skin dries. Cut the thread close, say, 2 mm. above the knot. Before returning the needle to the place selected for it, tie a knot in the thread so that it will be ready for instant use to sew together the lips of the next specimen that will be stuffed.

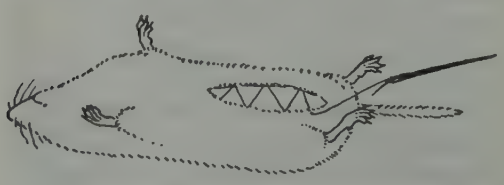


Fig. 552. Sewing a stuffed skin. X ¾.

Lay the stuffed skin belly-down with hind feet projecting over the near edge of the skinning board. Tie on the label above right heel; take double turn (on the thread, not the leg), pull the thread almost as tight as possible without breaking it, complete as a square knot or tie four alternate granny knots. Cut off the loose ends of the string. The aims are first to tie the knot so snug that it will not slip off after the diameter of the heel and foot has decreased owing to drying out, and, second, to tie the knot so secure that it will have to be cut to remove the label.

Use a toothbrush having soft bristles to comb the pelage.

Select 8 glass-headed pins no longer than the depth of the drying tray. Pin down the skin in the form shown in Figure 553. Pin down the forefeet first, seeing that

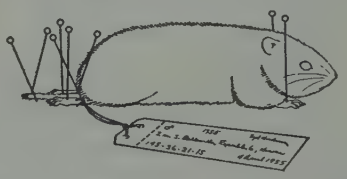


Fig. 553. Completed skin pinned down to dry. X ¾.

each foot has the palm flat down on the board. The forefeet should be underneath the head well toward the midline of the body. Slant the pins outward so that they will not crease the skin or fur of the sides of the head. Next pin down the base of the tail by crossing two pins over it, in the fur at its base instead of over the bare part of the tail. Line up the tip of the nose, base of the tail, and tip of the tail; then pin down the tip by means of two crossed pins. Finally pin down the two hind feet. Inspect the stuffed animal from the rear to see that the two hind feet are equidistant from the tail; inspect from the front to see that the two forefeet are equidistant from the nose, and inspect from each side to see that the tips of the toes of each pair of feet are correctly arranged in anterior to posterior position.

By means of a pair of forceps, or by means of a thumb and forefinger, compress each external ear so that the two ears will be creased exactly alike. This helps in causing them to lie down flat as they dry, and if the

treatment is repeated on the following day, the ears are more likely to be symmetrical when thoroughly dry.

Use a metal pin, the back of a scalpel, or the sharp edge of forceps to smooth the pelage. Set the tray where the skin can dry in a shady, airy place safe from animals and storms. Two days to two weeks later, whenever the skin is thoroughly dry, it can be unpinned. The amount of humidity has most to do with the time required for drying; in a hot, dry desert, rodent skins may dry in 24 hours, but in a humid, hot, tropical setting, the skins may never dry unless artificial heat is used to drive out the moisture.

With practice the average preparator can complete a specimen in twelve to fifteen minutes. The most rapid preparator that we know did the job in slightly less than five minutes. He, however, could not maintain that pace and actually turned out approximately eight specimens per hour. Self-analysis reveals to the beginner that he is making unnecessary movements. Attention to the elimination of superfluous movements probably is the best method of increasing the speed of preparation.

Many persons have suggested means of saving the skins of small mammals without stuffing them, or means of partly stuffing them, as for example with only a piece of flat cardboard. Such skins are less useful for studying geographic variation and speciation than those prepared by the method described above, because such studies require comparisons of the new specimens with old specimens—specimens prepared in earlier years. Satisfactory comparisons are made only with specimens prepared in the same form. Since nearly all of the specimens from the past were prepared according to the method described above, specimens to be saved now are most useful if they also are prepared as described above.

An exception of a sort is made for rabbits in that the artificial bodies are prepared in a fashion different than that described above. The approved method is the following: Cut a piece of corrugated cardboard for the center of the body; attach a straight stick to the cardboard at two places by means of wire or twine so that the stick strengthens the cardboard and projects far behind the cardboard to form a paddle; cover the cardboard with a thin (¼-in.) layer of smooth cotton bringing the two edges of the cotton together on the midline of the belly-side of the body along the stick; turn the skin, prepared in the usual way even to the legs, over the flattened body; with heavy shears cut off the posterior end of the cardboard to an appropriate shape; by means of monel metal wire or a large sacking needle and twine sew through each hind foot around the stick at two places so that the stick will support the two hind legs; with a single stitch secure each forefoot to the skin of the throat; sew up the slit in the belly; thrust a single pin (to be removed when the skin is dry) through the tip of each ear to secure the ears in the desired position; tie the label on the right hind leg; lay the skin away to dry. The skin need not be pinned down. Some advantages of this method are that it provides maximum support for the long hind legs which are wobbly and subject to breakage if otherwise prepared; a flattened body that is strong allows the specimen to be stored in less space than would be required if the body were deeper; and the method requires a minimum of time for stuffing.

Flattening the bodies of all specimens is desirable, and the larger the specimen the thinner the body should be in relation to its width. Convenience in storing is one reason for flattening the bodies. In many collections of study specimens of mammals—for example, those in the University of Kansas Museum of Natural History—the storage cases have the runners so spaced that the distance between the topside of one tray bottom and the underside of the tray bottom next above is $1^{15}/_{16}$ in. Sectional cardboard trays are used for specimens of shrew size and mouse size and reduce the available vertical space to 1⅞ in. or slightly less. (The over-all depth of boxes to house skulls was the factor governing the vertical space between trays.) Because there is only 1⅞ in. of vertical space between trays, the artificial bodies of the smaller mammals, say, chipmunks, are made in such a size that the over-all height of a specimen is less than 1⅞ in. The pinning trays in the collecting-chests (part of the field equipment) have end pieces 1½ in. high. When the trays of freshly stuffed specimens are stacked in the chest, any specimen that is slightly more than the specified height is at once compressed to 1½ in. Once the skin has dried in that space the height will not increase much if any.

Specimens as large as jack rabbits and opossums may need to be slightly deeper than 1½ in. even if the artificial body is much flattened. The height of such a specimen should not exceed 2¾ in., because that height of body is almost the maximum that can be accommodated in a storage case by separating succeeding trays by one additional case-runner. The means of caring for these specimens in the trays of the collecting chest is to stack one empty pinning tray upside down on the pinning tray that contains the jack rabbits or opossums. In actual practice, however, some collectors keep the heights of even opossums and jack rabbits to 1¾ in.

In preparing study specimens of mammals, just as in doing other work, different methods will be found for gaining the same result. By slightly altering their methods from year to year, two preparators who used the same methods to begin with will employ appreciably different methods after the lapse of several years. It is understandable therefore that no two preparators of experience use exactly the same methods—and this, we think, is as it should be, for each preparator should constantly strive to improve the quality of his product. The aim should be firm, symmetrical skins free of all fat.

It seems to us that every preparator takes pride in his specimens and derives genuine personal gratification from the contemplation of one of his mammal specimens if well prepared, firmly made, and indelibly and accurately labeled. At such moments he may even consider the possibility that one or another of several particularly well-stuffed mice a century hence will be as deservingly spoken of and achieve more of favorable remembrance

for him than some other accomplishment at the moment better appreciated by his associates.

A few collectors have immersed skins in a salt-alum bath or treated them with only salt in order to preserve the skins until it was convenient to stuff them. Salt, or salt-alum solution, does alter the color of the pelage. We recommend against using these preserving agents even at a sacrifice in quantity of specimens. Also, it seems to us, that the least that should be done for study skins subjected to the salt-alum treatment or to *any* treatment offering fair likelihood of resultant color change is to label the skins at the time of preparation with clear indication of departure from the conventional technique.

A departure that we regard as the lesser of several evils is the soaking of autumn-taken skins of ground squirrels in white gasoline in order to remove surplus fat that may have been released by scraping the flesh side of the skin. Twelve to eighteen hours in gasoline removes the fat. Longer immersion tends to dehydrate the skin, making it difficult to shape properly and making it so brittle after it is dried that it may break. For the skins of some ground squirrels almost ready for hibernation, we know of no substitute for gasoline, carbon tetrachloride, or other compound that removes fat. Such skins that we degreased only by scraping and applying cornmeal or fine sawdust in order to absorb the fat, although seemingly free of fat at the time of stuffing, later showed some greasiness that spread to several parts of the skin and down the string or thread of the label onto the label. Gross inspection of skins of mammals almost ready to hibernate suggests that there are fat cells *in* the skin of some as well as on the flesh side of the skin. Scraping and using an absorbent such as cornmeal removes most of the fat but not all of it. In spring, when the same kinds of mammals are lean, the soaking of the skin in gasoline or in some other liquid compound is unnecessary—undesirable, in fact.

When a skin has to be washed in soap and water for the purpose of removing dirt, bloodstains, and the like, it can be dried more quickly if its final bath is in white gasoline instead of in water. This is because the gasoline displaces the water and the more volatile gasoline is quickly removed by cornmeal or sawdust in which the skin is buried or with which the skin is repeatedly dusted. Such a skin must be thoroughly dried until the fur is everywhere fluffy before being stuffed; otherwise the fur will always cling together in patches and be unsightly.

Mammal skins to be tanned. Skins that are to be tanned or stuffed at a later date should be cased. Slit the skin from hind feet, down inside of hind legs to base of tail, and split tail full length. Do not open pads of feet on carnivores. In deer, open front legs from "elbow" to hoof.

Fat on skins should be scraped off before skins are stretched for drying. It is not necessary to soak such skins in gasoline.

Do not apply salt, alum, or formalin to skins that are to be relaxed later. Stretch skins to dry, flesh-side out, over a board, cardboard, frame of wire, or two poles. When nearly dry, skins as large as those of deer may be rolled up for packing; skins of carnivores should be packed flat, with the tail folded on the body if desired, with a wisp of excelsior between the skins. Be sure that skins dry and that no fly eggs are on the skins when they are packed. Label dried skins with skull tags only.

Preparation of skulls. Skulls should be severed from the vertebral column, using extreme care not to injure the skull. Skulls the size of those of *Spermophilus franklinii* or larger should have the major part of the masseter muscle snipped off to allow the skull to dry quickly.

As soon as possible, skulls should be put in a glass container of cold water to soak for 12 hours, to remove the blood and loosen the brain. In very hot weather it may be necessary to change the water to prevent fermentation.

After removing the skulls from the water, blow out the brains with the aid of a hypodermic fitted with a blunt needle, or with an atomizer bulb fitted with a short rubber tube and blunt hypodermic needle.

Large and small skulls should not be strung on the same wire to dry. If, for example, squirrel and mouse skulls are strung together, some of the smaller skulls certainly will be more or less broken.

Above all, do not allow skulls to become fly blown. This is apt to occur when they are hung up to dry and while soaking, as some will float and thus be exposed to flies. Maggots do much damage by discoloring the bone, loosening the sutures, and obliterating data on tags. Never hang skulls in the sun—always in the shade and, if possible, where there is a breeeze. When skulls are quickly dried, any fly eggs deposited will not hatch. If, due to damp weather, the skulls are apt to remain soggy, protect them by cheesecloth (when hung up) to exclude flies. When packing skulls for shipment, or when moving camp, use a container with plenty of air holes. *Never* put damp or even dry skulls in air-tight containers; this causes sweating and maceration. For directions on cleaning mammal skulls, see Jour. Mammalogy, 14(4):372–374, 1933.

Preparation of skeletons. When preparing skeletons, skin the body completely, which means to the tip of the tail and to the claws of the feet. The pads of the feet of mammals and the skin on the tarsi of birds are nearly impervious to the dermestid beetles. Always "draw" the animal and cut off all large muscles. Tag skeletons (each separate piece) in the same way as skulls.

Take care to save baculum, hyoid bones, marsupial bones, patellas, tip of tail, pygostyle, and alula, as these are easily lost. Do not remove tongue or eyes; they contain important bones.

When a skeleton has been roughed out, wrap it with thread or string so that the head and extremities will not be broken off when they are dry and brittle. The legs are pulled up along the body and the head brought back. A few wrappings of thread will suffice for small skeletons. Do not use so much thread that the beetles have difficulty in getting to the meat in the cleaning process. Do not wrap too tightly, as fresh bones are easily bent.

The higher the humidity, the more thoroughly skeletons should be roughed out. Be sure to remove heart and lungs. A mammal skeleton the size of a squirrel's or larger should have its skull detached and its brains removed. Be sure to tie the skull to the body. A skeleton with its skull and leg bones packed in rib basket is slow in drying. Keep sawdust off skeletons. Tie an additional label on skeletons of extremely young animals calling attention to them, so that they will receive extra care in cleaning. See that each separate part has a tag.

Packing and shipping. Keep skins of mammals with you until thoroughly dry. In preparing for shipment, take special pains to pack specimens tight so that they will not move. Much of the smoothness and symmetry may be lost through loose packing.

FINAL SUGGESTIONS

Read above suggestions every few days when on a field trip, devoting half an hour or so to thoughtful consideration of the objects of your field work, which probably are: To ascertain everything possible in regard to the natural history of the mammals of the regions traversed, and to make careful records of the facts gathered in the form of specimens and notes to be preserved for all time. All this is for the *information* of others; strive to make your records in all respects clearly intelligible. Remember that the value of your notes increases as the years go by and faunal changes take place. Some earlier notebooks describe conditions now vanished in the localities with which they dealt.

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ADDENDA

Two new subspecific names and several marginal records published prior to November 1, 1957, are listed below. As of that date the names had been overlooked by us. The marginal records had not been entered in the manuscript for the same reason, or because engravings for Maps 1–500 had already been prepared. In addition, in so far as they have come to our attention, new specific and subspecific names, new name combinations, and significant extensions of known geographic ranges published in the period November 1, 1957, to August 30, 1958, are listed. The new names are in boldface type.

P. 5. *Didelphis marsupialis battyi* Thomas is arranged as a synonym of *Didelphis marsupialis marsupialis* Linnaeus by Cabrera (Revista Mus. Argentino Cienc. Nat., Cienc. Zool., 4(1):43, March 27, 1958).

P. 8. *Didelphis marsupialis etensis* J. A. Allen, *Didelphis marsupialis insularis* J. A. Allen, and *Didelphis marsupialis particeps* Goldman are arranged by Cabrera (*loc. cit.*) as synonyms of *Didelphis marsupialis marsupialis* Linnaeus.

P. 8. *Didelphis marsupialis virginiana.* The occurrence at Crescent Beach, British Columbia, reported by Carl and Guiguet (British Columbia Prov. Mus., Handbook 14:10, January, 1958) provides a marginal record within the shaded area on Map 1.

P. 9. *Chironectes panamensis panamensis* becomes *Chironectes minimus panamensis* according to Cabrera (*op. cit.*:44); inferentially, *Chironectes panamensis argyrodytes* becomes *Chironectes minimus argyrodytes*, and the genus *Chironectes* thus becomes monotypic.

P. 13. *Marmosa mitis isthmica* Goldman becomes *Marmosa robinsoni isthmica* according to Cabrera (*op. cit.*:24); inferentially, the other North American subspecies of *M. mitis* should stand as: *Marmosa robinsoni chapmani*, *Marmosa robinsoni fulviventer*, and *Marmosa robinsoni ruatanica*.

P. 20. Insectivora as an ordinal name is to be replaced by Lipotyphla according to McDowell (Bull. Amer. Mus. Nat. Hist., 115:201–210, May 5, 1958) who follows Butler (Proc. Zool. Soc. London, pp. 474–480, May, 1956). Further, McDowell regards the Nesophontidae (p. 77 of present work) as indistinguishable at the family level from the Solenodontidae (p. 20 of present work); the latter and the Soricidae (among American insectivores) are judged by McDowell (*op. cit.*) to be in a different suborder (Soricomorpha) than the family Talpidae (Erinaceomorpha).

P. 26. *Sorex cinereus cinereus.* The occurrence at mouth of Windy River, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:11, October 26, 1956), provides a marginal record within the shaded area on Map 12.

P. 29. **Sorex longirostris eionis** J. A. Davis (Amer. Mus. Novit., 1844:3, October 10, 1957), type from Homosassa Springs, Citrus Co., Florida.

P. 36. *Sorex nanus.* A specimen from 2 mi. E Ruidoso, Lincoln Co., New Mexico, reported by Findley (Jour. Mamm., 38:513, November 20, 1957) extends the known range approximately 135 miles southeastward from Capulin Ranger Station on Map 17.

P. 43. *Sorex fumeus umbrosus.* The occurrence 2 mi. W Souris in Kings Co., on Prince Edward Island, reported by Cameron (Jour. Mamm., 39:291, May 20, 1958) gives basis for shading that island on Map 21 (it is now unshaded).

P. 54. *Blarina brevicauda.* The occurrence (referred by us on geographical grounds to *B. b. manitobensis*) at Wakaw Lake, 35 mi. S Prince Albert, Saskatchewan, reported by Nero (Blue Jay, 15:177, December, 1957) extends the known range 122 miles west and 5 miles north of Somme, the northernmost dot in Saskatchewan on Map 29.

P. 60. *Cryptotis guerrerensis* Jackson is regarded as a synonym of *Cryptotis mexicana goldmani* (p. 59) by Davis and Lukens (Jour. Mamm., 39:350, August 20, 1958).

P. 65. *Notiosorex gigas.* The occurrence at Acahuizotla, 2800 ft., Guerrero, reported by Davis (Southwestern Nat., 2:174, June, 1958) extends the known range 388 miles south and east from Los Reyes, Michoacán, shown on Map 36. Davis used the name *Megasorex gigas.*

P. 88. *Noctilio labialis minor* Osgood is a synonym of *Noctilio labialis labialis* (Kerr), and the type locality of the latter is the Mosquito Coast, Nicaragua, according to Cabrera (Revista Mus. Argentina Cienc. Nat., Cienc. Zool., 4(1):55–56, March 27, 1958), but, see Hershkovitz (Bull. U. S. Nat. Mus., 99:433–434, May 10, 1949).

P. 91. *Chilonycteris psilotis.* The occurrence at Rancho Nacimiento del Río Coy, 16 mi. S Valles, San Luis Potosí, reported by Constantine (Jour. Mamm., 39:293, May 20, 1958) "extends the known range some 330 miles northwestward [from 3 km. E San Andrés Tuxtla] on the east coast of Mexico" on Map 55.

P. 94. **Pteronotus suapurensis calvus** Goodwin (Amer. Mus. Novit., 1871:1, February 26, 1958), type from Tehuantepec, 150 ft., Oaxaca.

P. 120. *Choeronycteris mexicana.* The specimen from 10 mi. S Rodeo, Hidalgo Co., New Mexico, reported by Findley (Jour. Mamm., 38:513, November 20, 1957) provides a marginal record within the shaded area on Map 83.

P. 122. **Leptonycteris nivalis sanborni** Hoffmeister (Jour. Mamm., 38:456, November 20, 1957), type from Miller

Canyon, Huachuca Mts., 10 mi. SSE Ft. Huachuca, Cochise Co., Arizona. Hoffmeister (*op. cit.*:454–461) reviews the bats of the genus *Leptonycteris*.

P. 183. **Pipistrellus subflavus floridanus** W. H. Davis (Proc. Biol. Soc. Washington, 70:213, December 31, 1957), type from Homosassa Springs, head of Homosassa River, Citrus Co., Florida.

P. 207. *Tadarida femorosacca*. The occurrence at Carlsbad Cavern, Eddy Co., New Mexico, reported by Constantine (Jour. Mamm., 39:293, May 20, 1958) extends the known range 361 miles east from Fort Huachuca, Arizona, on Map 153.

P. 217. *Molossus major obscurus* (É. Geoffroy St.-Hilaire) is arranged by Cabrera (Revista Mus. Argentino Cienc. Nat., Cienc. Zool., 4(1):131–132, March 27, 1958) as a synonym of *M. m. major*.

P. 230. *Ateles geoffroyi*. The occurrences (referred by us on geographical grounds to *A. g. vellerosus*) reported from 10 km. NNW Cihuatlán, Jalisco, and from 25 km. NNW Cd. Victoria, Tamaulipas, by Villa R. (Anal. Inst. Biol., 28:346–347, 1958) provide marginal records within the shaded area of Map 170, one record each at the northern end of the two northern arms of the shaded area.

P. 244. *Dasypus novemcinctus davisi*. The occurrences at Acahuizotla, 2800 ft., and from Agua del Obispo, 3300 ft., Guerrero, recorded by Davis and Lukens (Jour. Mamm. 39:362, August 20, 1958) provide southern marginal records for *D. n. davisi* on Map 178 in the area there ascribed to *D. n. mexicanus*.

P. 247. *Ochotona collaris*. Marginal records north of the shaded area on Map 179 are reported in Alaska by Libby (Jour. Mamm., 39:448, August 20, 1958) as follows: head of Seward Creek, Glacier Mtn., near Eagle; near Mile Post 105 on Steese Highway (lat. 65° 30′ N, long. 145° 30′ W); near Mile Post 80 on Steese Highway (lat. 65° 30′ N, long. 146° W).

P. 259. *Sylvilagus palustris*. The occurrence (referred by us on geographical grounds to *S. p. palustris*) in Glascock County, Georgia, reported by Lowe (Jour. Mamm., 39: 118, fig. 1, February 20, 1958) provides a marginal record within the shaded area on Map 184.

P. 265. *Sylvilagus audubonii arizonae*. The occurrence at Gold Hill, Tooele Co., Utah, reported by Shippee and Egoscue (Jour. Mamm. 39:275, May 20, 1958) extends the known range 32 miles northwest of a place 2 mi. SW of Fish Springs shown on Map 187.

P. 269. *Sylvilagus aquaticus aquaticus*. The occurrences in Murray, Wilkes, Hancock, Macon, and Randolph counties, Georgia, reported by Lowe (*loc. cit.*) extend the known range outside the shaded area on Map 184 and indicate that *S. a. aquaticus* ranges throughout that part of Georgia not included in the range of *Sylvilagus palustris palustris*.

P. 273. *Lepus americanus americanus*. The occurrence at a point 40 mi. NE Windy River, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:16, October 26, 1956) is approximately 25 miles northwest of the shaded area on Map 189.

P. 277. *Lepus arcticus andersoni*. The occurrence at Windy River, Keewatin, reported by Harper (*op. cit.*:13) is approximately 10 miles south of the shaded area on Map 190.

P. 285. *Lepus mexicanus*. The occurrence 1 mi. W Quechultenango, 3000 ft., Guerrero, recorded by Davis and Lukens (Jour. Mamm., 39:361, August 20, 1958) as *L. callotis*, extends the known range 68 miles westward from Tlapancingo, Oaxaca, on Map 193.

P. 302. *Eutamias minimus jacksoni* is regarded as a valid subspecies by Jackson (Jour. Mamm., 38:518–519, November 20, 1957). We have listed *jacksoni* as a synonym of *E. m. neglectus*.

P. 311. *Eutamias dorsalis utahensis*. Shippee and Egoscue (Jour. Mamm., 39:276, May 20, 1958) list specimens from several localities in west-central Utah that give basis for shading that entire area on Map 203.

P. 320. *Eutamias bulleri durangae*. The occurrence at Rancho Las Margaritas, Durango, reported by Drake (Publ. Mus., Michigan State Univ., Biol. Ser., 1:104, July 24, 1958) provides a marginal record of *E. b. durangae* within the range of *E. b. bulleri* as shown on Map 210.

P. 324. *Marmota flaviventris avara*. The occurrence at the headwaters of Granite Creek, 8500 ft., in the Deep Creek Mts., Juab Co., Utah, recorded by Shippee and Egoscue (Jour. Mamm., 39:276, May 20, 1958) extends the known range 5½ miles east of the Utah boundary on Map 212.

P. 348. *Spermophilus mexicanus parvidens*. McCarley (Southwestern Nat., 1:31, June 4, 1956) summarizes Texan records and defines more precisely than we do some localities listed by us as marginal. Also he records the subspecies from Austin, Travis Co., Texas, thereby extending the known range 84 miles east and south of Mason, Texas, on Map 226.

P. 370. *Sciurus carolinensis*. The occurrence, believed to represent an introduced individual, reported from Rose Valley, about 33 mi. S Tisdale, Saskatchewan, by Nero (Blue Jay, 16:80, June, 1958) is outside the shaded area on Map 239. See also Nero (Blue Jay, 16:33–35, March, 1958).

P. 392. *Sciurus nayaritensis*. The occurrence at Rancho Las Margaritas, Durango, reported by Drake (Publ. Mus., Michigan State Univ., Biol. Ser., 1:104, July 24, 1958) provides a marginal record within the shaded area on Map 250.

P. 402. *Tamiasciurus hudsonicus preblei*. The occurrence at the mouth of Windy River, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:19, October 26, 1956) provides a marginal record within the shaded area on Map 257.

P. 410. *Glaucomys sabrinus gouldi*. The occurrence at Rollo Bay, 3 mi. W Souris, Kings Co., Prince Edward Island, reported by Cameron (Jour. Mamm., 39:291, May 20, 1958) is outside the shaded area on Map 260. The species had not previously been recorded from the Island.

P. 420. *Thomomys umbrinus apache* V. Bailey is arranged as a synonym of *Thomomys bottae* [= *umbrinus*] *aureus* J. A. Allen by Youngman (Univ. Kansas Publ., Mus. Nat. Hist., 9:370, February 21, 1958).

P. 426. *Thomomys umbrinus internatus*. Youngman (*op. cit.*:375) lists specimens from a number of localities that are marginal; some of these localities extend the known range approximately 50 miles eastward beyond the shaded area on Map 263.

P. 429. *Thomomys umbrinus optabilis* Goldman is arranged as a synonym of *Thomomys bottae* [= *umbrinus*] *aureus* J. A. Allen by Youngman (*op. cit.*:370).

P. 432. **Thomomys bottae rubidus** Youngman [= *Thomomys umbrinus rubidus*] (*op. cit.*:376), type from 2⅘ mi. E Cañon City, 5344 ft., Fremont Co., Colorado.

P. 450. **Geomys bursarius missouriensis** McLaughlin (Los Angeles County Mus., Contrib. Sci., 19:1, January 29, 1958), type from 2 mi. N Manchester, St. Louis Co., Missouri.

P. 476. *Perognathus fasciatus fasciatus.* Occurrences at Sceptre and Imperial, Saskatchewan, reported by Nero (Blue Jay, 15:172, December, 1957) extend the known range 45 and 110 miles, respectively, north of the shaded area on Map 284.

P. 484. *Perognathus longimembris gulosus.* The occurrence at the N end Little Granite Mtn., Tooele Co., Utah, recorded by Shippee and Egoscue (Jour. Mamm., 39:276, May 20, 1958) extends the known range 64 miles east of the Nevada-Utah boundary on Map 289.

P. 508. *Microdipodops megacephalus leucotis.* Specimens recorded by Shippee and Egoscue (Jour. Mamm., 39:277, May 20, 1958) from four localities (Cedar Mts., 3 mi. W Sand Pass; 4 mi. E Camel Back Mtn.; 1 mi. W Granite Mtn.; and 7 mi. NE Granite Mtn.) in Tooele County, Utah, provide marginal records within the shaded area on Map 304.

P. 548. *Castor canadensis canadensis.* The occurrence at a point about 6 mi. above mouth Little River, Keewatin, by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:24, October 26, 1956) provides a marginal record within the shaded area on Map 321.

P. 587. *Reithrodontomys megalotis.* The occurrence (referred by us on geographical grounds to *R. m. megalotis*) at a point 2 mi. N Okanagan Landing, British Columbia, reported by Munro (Canadian Field-Nat., 72:146, August, 1958) extends the known range 54 miles northward from the NE end of Skaha Lake on Map 342.

P. 592. *Reithrodontomys fulvescens canus.* The occurrence at a point 22 mi. S, 2 mi. E Rodeo, Hidalgo Co., New Mexico, reported by Findley and Pullen (Jour. Mamm., 39:306–307, May 20, 1958) provides a marginal record within the shaded area on Map 346.

P. 596. *Reithrodontomys mexicanus mexicanus.* A specimen from 2 mi. N Pluma Hidalgo, 4400 ft., Oaxaca, recorded by Jones and Anderson (Jour. Mamm., 39:447, August 20, 1958) extends the known range approximately 94 miles south-southwest from Totontepec on Map 349.

P. 598. *Reithrodontomys mexicanus.* A specimen (referred by us tentatively on geographical grounds to *R. m. riparius*) reported from Uruapan, Michoacán, by Hooper (Jour. Mamm., 38:521, November 20, 1957) extends the known range 85 miles northeastward from Coalcomán on Map 349.

P. 599. *Reithrodontomys microdon wagneri.* The occurrence SE of Sirio, on N slope of Sierra Patamba, 9100 ft., Michoacán, reported by Jones and Anderson (Jour. Mamm., 39:447, August 20, 1958) extends the known range approximately 108 miles westward from the type locality on Map 350.

P. 622. According to Jones (Proc. Biol. Soc. Washington, 71:107–111, July 16, 1958) the type locality of *Peromyscus maniculatus nebrascensis* is Deer Creek, approximately 5 miles from its mouth, Converse Co., Wyoming [not Deer Creek, Nebraska], and *P. m. nebrascensis* is thus the valid name for the subspecies designated as *P. m. osgoodi* on p. 622 and on Map 355. *P. m. osgoodi* thus is a synonym of *P. m. nebrascensis.* The name *Peromyscus maniculatus luteus* (type locality Kennedy, Cherry Co., Nebraska) replaces the name *P. m. nebrascensis* on p. 622 and in the legends for Maps 355, 356 and 357.

P. 635. *Peromyscus boylii rowleyi.* The occurrence at Rancho Las Margaritas, Durango, recorded by Drake (Publ. Mus., Michigan State Univ., Biol. Ser., 1:105, July 24, 1958) provides a marginal record within the shaded area on Map 364.

P. 659. *Baiomys taylori analogus* is regarded as a subspecies different from *Baiomys taylori allex* by Packard (Proc. Biol. Soc. Washington, 71:17–18, April 11, 1958). We have listed *analogus* as a synonym of *allex.*

P. 676. **Sigmodon hispidus villae** Goodwin (Amer. Mus. Novit., 1871:2, February 26, 1958), type from 5 mi. SE Teopisca, 6000 ft., Chiapas.

P. 691. **Neotoma lepida aridicola** Huey (Trans. San Diego Soc. Nat. Hist., 12:287, September 25, 1957), type from El Barril (near 28° 20′ N), Gulf of California, Baja California.

P. 713. *Clethrionomys gapperi athabascae.* The occurrence at the mouth of Windy River, Keewatin, by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:29, October 26, 1956) provides a marginal record approximately 20 miles within the range of *C. g. hudsonius* as shown on Map 401.

P. 755. *Ondatra zibethicus albus.* The occurrence at Windy River, SW of Simon's Lake, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:44, October 26, 1956) provides a marginal record within the shaded area on Map 423.

P. 762. **Synaptomys cooperi relictus** Jones (Univ. Kansas Publ., Mus. Nat. Hist., 9:387, May 12, 1958), type from Rock Creek State Fish Hatchery, 5 mi. N, 2 mi. W Parks, Dundy Co., Nebraska.

P. 766. *Dicrostonyx groenlandicus richardsoni.* The occurrence 1 mi. NW mouth Windy River, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:25, October 26, 1956) provides a marginal record within the shaded area on Map 427.

P. 779. *Napaeozapus insignis insignis.* The occurrence at a point 2 mi. W Souris, Kings Co., Prince Edward Island, recorded by Cameron (Jour. Mamm., 39:291, May 20, 1958) provides a marginal record within the shaded area on Map 431.

P. 781. *Erethizon dorsatum dorsatum.* The occurrence 18 mi. N Windy River, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:45, October 26, 1956) provides a marginal record within the shaded area on Map 432.

P. 808. *Mesoplodon densirostris.* This species is reported from Green Turtle Cay (lat. 26° 46′ N, long. 77° 18′ W), Abaco, Bahama Islands, by Moore (Amer. Mus. Novit., 1897:1, July 22, 1958).

P. 828. *Globicephala melaena.* This species is recorded from Assateague Island, Accomack Co., Virginia, by Paradiso (Jour. Mamm., 39:440, August 20, 1958). According to him, previously reported specimens of *G. melaena* from Virginia all are referable to *Globicephala macrorhyncha.*

P. 831. **Phocoena sinus** Norris and McFarland (Jour. Mamm., 39:24, February 20, 1958), type from NE shore Punta San Felipe, Gulf of California, Baja California. Norris and McFarland (*op. cit.*:32) conclude that *Phocoena vomerina*, the Pacific harbor porpoise, is indistinguishable from *Phocoena phocoena*, and that *Phocoena tuberculifera* Gray, 1865 (type from River Thames, England), also is a synonym of *P. phocoena.*

The record herein (p. 831) of *P. vomerina* from Banderas Bay, Jalisco, in the light of the remarks by Norris and McFarland (*op. cit.*) seems to be instead a record of the new species, *P. sinus.* The most southerly record of *P. vomerina* [= *P. phocoena* according to the authors] is regarded as San Pedro Channel, off San Pedro, California (*op. cit.*:35).

P. 848. *Canis lupus hudsonicus.* The wolf reported from one mile south of mouth of Windy River, Keewatin, by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ.,

12:48, October 26, 1956) provides a marginal record within the shaded area on Map 444.

P. 857. *"Vulpes fulva ? regalis."* The occurrence along the Upper Kazan River, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:59, October 26, 1956) provides a marginal record within the shaded area on Map 447.

P. 861. *Urocyon cinereoargenteus nigrirostris.* The occurrence reported as *U. c. colimensis* at Rancho Las Margaritas, Durango, by Drake (Publ. Mus., Michigan State Univ., Biol. Ser., 1:105, July 24, 1958) provides a marginal record within the shaded area on Map 449.

P. 863. *Urocyon cinereoargenteus ocythous.* The occurrences at Old Fort Point, lat. 58° 36′ N, long. 110° 27′ W, Lake Athabaska, Alberta, reported by Moore (Jour. Mamm., 33:253, May 14, 1952), and that at St. Adolphe, Manitoba, by Sutton (Jour. Mamm., 39:439, August 20, 1958) extend the range far northward from that shown on Map 449.

P. 865. *Speothos panamensis* (Goldman) becomes *Speothos venaticus panamensis* according to Hershkovitz (Nov. Colombianas, Mus. Hist. Nat. Univ. del Cauca, 3:161, December 1, 1957).

P. 865. According to Hershkovitz (Säug. Mitteil., 5:122, August 1, 1957), the South American spectacled bear, *Tremarctos ornatus* (F. Cuvier), possibly occurs in the Serranía del Darién, eastern Panamá. The genus *Tremarctos* differs from all other living genera of ursids in having the masseteric fossa of the mandible separated into two distinct parts by a bony ridge.

P. 867. *Ursus americanus americanus.* The occurrence along the Kazan River, about 20 mi. E north end Ennadai Lake, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:61, October 26, 1956) provides a marginal record within the shaded area on Map 451.

P. 868. *Ursus americanus machetes.* The occurrence at Rancho Las Margaritas, Durango, reported by Drake (Publ. Mus., Michigan State Univ., Biol. Ser., 1:105, July 24, 1958) provides a marginal record within the shaded area on Map 451.

P. 882. **Jentinkia sumichrasti latrans** Davis and Lukens [= *Bassariscus sumichrasti latrans*] (Jour. Mamm., 39:353, August 20, 1958), type from near Puentecilla, 2510 m., Guerrero. Davis and Lukens review the Mexican subspecies of *B. sumichrasti* (*op. cit.*:352–353) and regard *Bassariscus sumichrasti oaxacensis* (Goodwin) as a synonym of *B. s. sumichrasti*. Cacomistles from as far east as the Guatemalan border are regarded by them as *B. s. sumichrasti*, not as *B. s. variabilis* (see Map 455).

P. 887. *Procyon lotor hirtus.* The occurrence at Leacross, Saskatchewan, reported by Santy (Blue Jay, 16:37, March, 1958) is 100 miles north and 27 miles east of Regina, the one locality in Saskatchewan shown on Map 456.

P. 888. *Procyon lotor mexicanus.* The occurrence at Rancho Las Margaritas, Durango, reported by Drake (Publ. Mus., Michigan State Univ., Biol. Ser., 1:105, July 24, 1958) provides a marginal record within the shaded area on Map 456.

P. 895. *Potos flavus guerrerensis* is reported from Acahuizotla, 2800 ft., Guerrero, by Davis and Lukens (Jour. Mamm., 39:355, August 20, 1958). The occurrence at Acahuizotla provides a marginal record because our symbol in central Guerrero on Map 459, supposedly representing Ometepec, is not in the correct place. Ometepec is actually "a town at about 1,000 feet on the Río Ometepec, about 20 miles from the coast, and very near the boundary of the state of Oaxaca" (Goldman, Smiths. Miscl. Coll., 115:156, July 31, 1951). Acahuizotla is within the shaded area on Map 459, approximately 32 miles southeast of the misplaced dot.

P. 898. *Mustela americana abieticola.* The occurrence 12 mi. N Windy River, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:65, October 26, 1956) provides a marginal record within the shaded area on Map 461.

P. 903. *Martes pennanti* (referred by us on geographical grounds to *M. p. pennanti*) is recorded from an archeological site in Madison County, Illinois, by Parmalee (Jour. Mamm., 39:153, February 20, 1958).

P. 908. Reichstein (Zeitschrift für Säugetierkunde, 22:169, 1958) seems to have shown that *Mustela rixosa* is only subspecifically distinct from the earlier named *Mustela nivalis*. If such is the case, the correct names of North American least weasels are: *Mustela nivalis allegheniensis, Mustela nivalis campestris, Mustela nivalis eskimo*, and (p. 909) *Mustela nivalis rixosa.*

P. 908. *Mustela rixosa allegheniensis.* The occurrence in southeastern Bradford Co., Pennsylvania, recorded by Richmond and McDowell (Jour. Mamm., 33:252, fig. 1, May 14, 1952) extends the known range approximately 95 miles north-northeastward from Middle Paxton Township on Map 464.

P. 909. *Mustela rixosa.* The occurrence (referred by us on geographical grounds to *M. r. rixosa*) on Elsie Island [lat. 58° 50′ N, long. 79° 09′ 36″ W], Hudson Bay, reported by Burt (Jour. Mamm., 39:291, May 20, 1958) provides a record in Hudson Bay on Map 464.

P. 912. *Mustela frenata leucoparia.* The occurrence at Acahuizotla, 2800 ft., Guerrero, recorded by Davis and Lukens (Jour. Mamm., 39:358, August 20, 1958) provides, within the shaded area on Map 465, the southernmost marginal record of occurrence and the first record from the state of Guerrero.

P. 913. *Mustela frenata noveboracensis.* The occurrence at Petit-Pré, Montmorency Co., Quebec, reported by Cameron (Jour. Mamm., 33:253, May 14, 1952) provides an extension of known range of 78 miles north-northeast of Black Lake on Map 465.

P. 918. *Mustela vison lacustris.* Occurrences reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:68, October 26, 1956) from Keewatin provide the following marginal localities within the shaded area on Map 467: Little Dubawnt River; Kazan River, near Ennadai Lake; 12 mi. above mouth Little River.

P. 933. *Spilogale angustifrons angustifrons* is regarded by Davis and Lukens (Jour. Mamm., 39:357, August 20, 1958) as specifically the same as *S. gracilis*. They use the name *Spilogale gracilis angustifrons*. Inferentially, Davis and Lukens would combine with the specific name *S. gracilis* the other subspecific names currently combined by other authors with the specific name *S. angustifrons.*

P. 939. *Mephitis macroura macroura.* The occurrence at a point 1 mi. SW Colotlipa, 2700 ft., Guerrero, recorded by Davis and Lukens (Jour. Mamm., 39:357, August 20, 1958), extends the known range 83 miles south and east from Taxco, Guerrero, on Map 474.

P. 939. *Mephitis macroura milleri.* The occurrence at Rancho Las Margaritas, Durango, reported by Drake (Publ. Mus., Michigan State Univ., Biol. Ser., 1:104, July 24, 1958) provides for *M. m. milleri* the southernmost marginal record in the shaded area ascribed to *M. m. macroura* on Map 474.

P. 941. *Conepatus mesoleucus nelsoni.* The occurrences recorded by Davis and Lukens (Jour. Mamm., 39:358, August 20, 1958) in Guerrero at Acapulco, Ometepec, 1000 ft., and Acahuizotla fall within the range shown for *C. m. mesoleucus* on Map 475 and provide marginal records for *C. m. nelsoni.* Hog-nosed skunks "seem to be absent from the Balsas Basin" (*loc. cit.*).

P. 942. *Conepatus mesoleucus sonoriensis.* The occurrence at Rancho Las Margaritas, Durango, reported by Drake (Publ. Mus., Michigan State Univ., Biol. Ser., 1:104, July 24, 1958) provides a marginal record for *C. m. sonoriensis* within the shaded area ascribed to *C. m. mearnsi* on Map 475.

P. 946. *Lutra canadensis preblei.* The occurrences in the Kazan River at the outlet of Ennadai Lake, and from near the mouth of the Windy River, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:72, October 12, 1956) provide marginal records within the shaded area on Map 477.

P. 948. *Lutra annectens annectens.* The specimens from the Río Chapolapa, near Chapolapa, 1000 ft., Guerrero, recorded by Davis and Lukens (Jour. Mamm., 39:359, August 20, 1958) provide a record from that state within the shaded area on Map 477. Davis and Lukens regard *Lutra annectens latidens* J. A. Allen as a synonym of *L. a. annectens.*

P. 958. *Felis concolor mayensis.* The specimen from 3 km. E Acahuizotla, 2800 ft., Guerrero, recorded by Davis and Lukens (Jour. Mamm., 39:360, August 20, 1958), provides the northwesternmost record of occurrence in the shaded area on Map 479.

P. 962. *Felis wiedii glacula.* The occurrence near Acahuizotla, 2800–4000 ft., Guerrero, recorded by Davis and Lukens (Jour. Mamm., 39:360, August 20, 1958), is in the shaded area on Map 481 but provides the southeasternmost marginal record.

P. 970. *Lynx rufus escuinapae.* The occurrence at Rancho Las Margaritas, Durango, reported by Drake (Publ. Mus., Michigan State Univ., Biol. Ser., 1:104, July 24, 1958) provides a marginal record for *L. r. escuinapae* within the shaded area ascribed to *L. r. baileyi* on Map 485.

P. 974. *Callorhinus ursinus cynocephalus* (Walbaum) becomes *Callorhinus ursinus* (Linnaeus) according to Scheffer (Seals, sea lions and walruses, a review of the Pinnipedia, p. 82, April 24, 1958), who regards the species as monotypic.

P. 974. *Arctophoca* Peters is regarded as a synonym of *Arctocephalus* É. Geoffroy St.-Hilaire and F. Cuvier by Scheffer (*op. cit.*:74–75).

P. 975. *Arctophoca townsendi* becomes *Arctocephalus philippii townsendi* according to Scheffer (*op. cit.*:80).

P. 976. *Zalophus californianus* becomes *Zalophus californianus californianus* according to Scheffer (*op. cit.*:60).

P. 979. Scheffer (*op. cit.*:88–106) regards the four subgenera of *Phoca* (*Phoca*, p. 979; *Histriophoca*, p. 980; *Pusa*, p. 981; *Pagophilus*, p. 982) as distinct genera and employs the appropriate name-combinations.

P. 980. Scheffer (*op. cit.*:92) lists *Phoca vitulina geronimensis* as a synonym of *P. v. richardii.*

P. 981. Scheffer (*op. cit.*:97) lists *Phoca hispida beaufortiana* as a synonym of *P. h. hispida.*

P. 982. Scheffer (*loc. cit.*) lists *Phoca hispida soperi* as a synonym of *P. h. hispida.*

P. 1006. *Dama hemionus hemionus.* The occurrence at Nueltin Lake, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:75, October 26, 1956) extends the known range approximately 300 miles northeast of the shaded area on Map 490.

P. 1008. *Dama virginiana acapulcensis.* Davis and Lukens (Jour. Mamm., 39:364, August 20, 1958) "anticipate that when adequate material is available for study, the small deer of Central America will be found to constitute an allopatric species distinct from *virginiana* and comprised of several geographic races including, among other[s], *acapulcensis* and *toltecus.*"

P. 1014. *Alces alces americana* was introduced into Newfoundland "where it is now established" according to Peterson (North American moose, p. 10, 1955). Our account and Map 493 do not record the moose in Newfoundland.

P. 1015. *Alces alces andersoni.* The occurrence at Kazan River, 15 mi. below Ennadai Lake, Keewatin, reported by Harper (Univ. Kansas Mus. Nat. Hist., Miscl. Publ., 12:75, October 26, 1956) provides a marginal record within the shaded area on Map 493.

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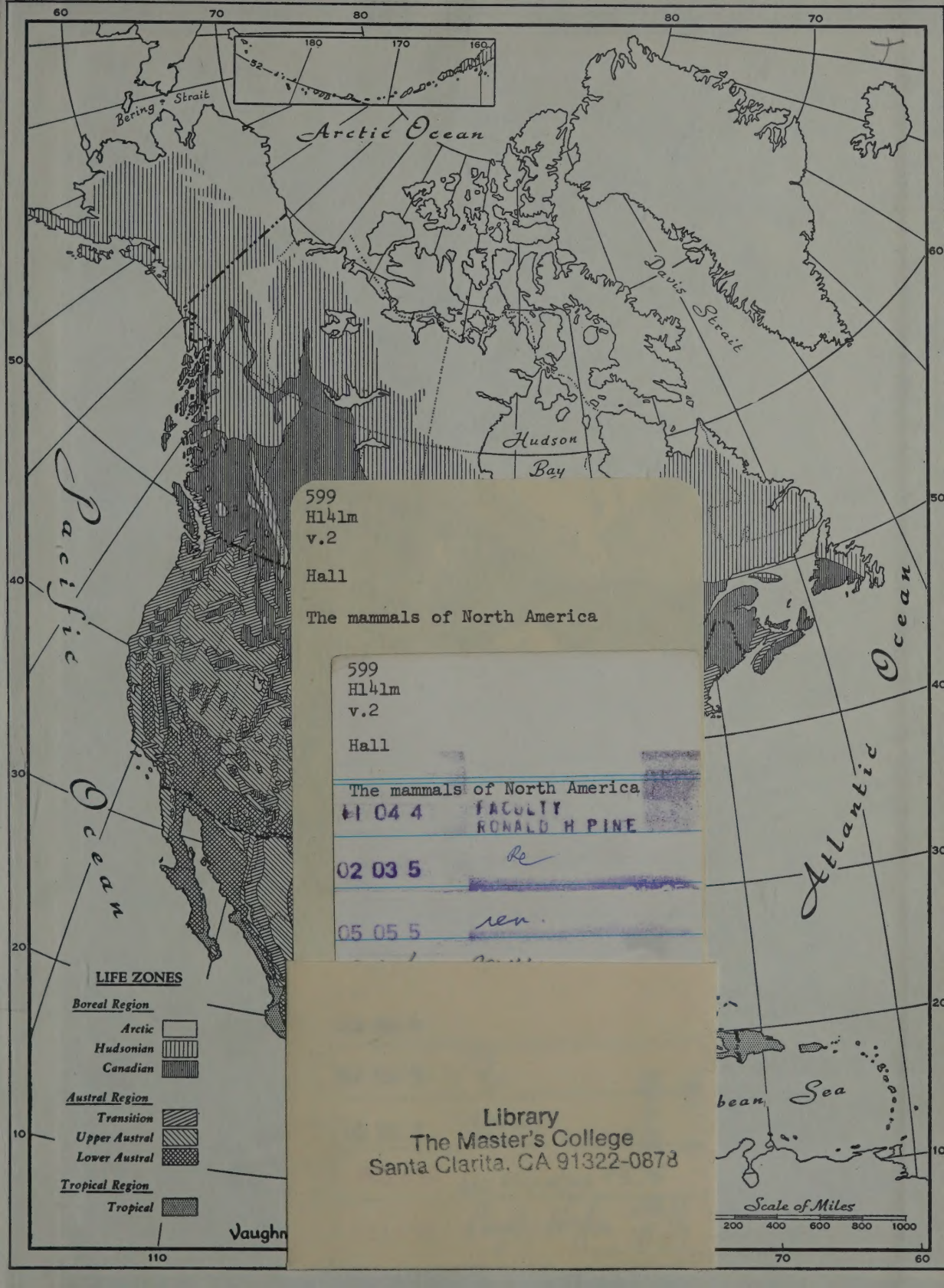

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